The examiners suggested the following additions to this thesis:

p.3, after heading "SCOPE OF STUDY"

A simple search for terms like "currency unification" or "currency union" in literature database like EconLit can clearly indicate how extensive the literature is. In particular, a number of criteria or dimensions have been raised in the literature for assessing whether the economies in concern constitute an optimal currency area (see Chapter 3). For a given time limit, incorporating more dimensions in the analysis will inevitably compromise the depth of investigation for each dimension. Being aware of this tradeoff, this thesis focuses on eclectic issues that are of particular relevance to Hong Kong and China. These issues are chosen either because the monetary union literature is yet to cover them, or because there are substantial room for extension. Nevertheless, in order to maintain the comprehensiveness of this thesis, many studies that cover other dimensions are discussed wherever appropriate. Results of related empirical studies are also reviewed in order to complement the findings of this thesis.

p.88, after line 22 "prove the transmission mechanism."

Possible transmission channels between the two economies include investment and trade (see section 2.4). Suppose an upbeat assessment of economic prospect stimulates an investment bloom and thus an output rise in China. The positive assessment of China's economy is likely to trigger a similar sentiment in Hong Kong due to foreseeable demand from China for Hong Kong's middleman services. As a result, investment will expand in Hong Kong too. In this case, the supply shocks upon the two economies are correlated but with a lag. A case to demonstrate this relationship is the impact of Deng Xiaoping's southern tour in early 1992. The tour stirred up not only the then depressed Chinese economy, but also the stock and property markets in Hong Kong (see section 6.2.1.2).

p.158, after the heading "ANALYTICAL RESULTS"

The model laid down in section 5.4 can be used to analyze the interrelation between trade structure and the choice of nominal anchor. In general, the impact of an exogenous shock upon the entrepot A changes with its choice of nominal anchor and the nature of the shock. Nevertheless, the impact changes also with the structure of the entrepot's trade regime. It is demonstrated below that, certain trade structures can reduce the difference between the impacts under different nominal anchors. That is, specific trade structures can lessen the importance of choosing the "right" nominal anchor, especially when there is uncertainty about the nature of disturbances.

Typos

p. 50 line 4

"…this popular Hong Kong saying.." should be read "…this popular Hong Kong saying.".

p.226 equation (7.1c)

K_{Ki} should be read K_i.

p.228 equation (7.2h)

$(r^* + \delta_K)$ should be read $(r + \delta_K)$.

K_{Ki} should be read K_i.

p.228 equation (7.2i)

$(r^* + \delta_H)$ should be read $(r + \delta_H)$.

p.230 equation (7.4h)

$\beta_{20}[(H_4)^{\beta 21}(C_4)^{1-\beta 22}]^{\beta 23}$ should be read $\beta_{21}[(H_4)^{\beta 22}(C_4)^{1-\beta 22}]^{\beta 23}$.

ONE COUNTRY, TWO SYSTEMS, HOW MANY MONIES?

Essays on the Exchange Rate Arrangement of Hong Kong

Kam Ki Tang

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Doctor of Philosophy
of
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DECLARATION

This dissertation represents my own original work except where otherwise acknowledged.

Kam Ki Tang

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ABSTRACT

This thesis is a collection of essays on the exchange rate arrangement of Hong Kong, focusing on the feasibility of unifying the Hong Kong dollar with the Chinese currency, renminbi.

The analytical framework of the thesis is founded on the theories of optimum currency area (OCA). Using a structural vector autoregression modeling technique, it found that the disturbances experienced by certain European countries are more correlated than those experienced by Hong Kong and China. However, if a two-quarter transmission time lag is allowed, the correlation of disturbances between Hong Kong and China becomes comparably significant. The results are consistent with the hypothesis that, as the two economies are of diverse economic structures, they are unlikely to be hit by symmetric shocks, although, through their deep economic linkages, disturbances are transmitted from the big economy China to the small economy Hong Kong. Furthermore, the more open and developed Chinese provinces around the coast, such as Guangdong, are more correlated with Hong Kong than are their inland counterparts.

Not only are China and Hong Kong found to not meet OCA criteria, but China also fails. Attributed to local protectionism, a single market has not yet formed amongst Chinese provinces. In terms of symmetry of disturbances, Chinese provinces are not as correlated as their European and American counterparts. Only one group of eastern provinces are found to be consistently strongly correlated. This suggests that treating China as an integrated economy could be misleading at both the micro and macro levels, and casts doubt on the effectiveness of using uniform monetary policies to manage the business cycles of all provinces.

While this thesis has largely benefited from the literature of European Monetary Union (EMU), it goes beyond that to address unique and important issues in the context of Hong Kong-China but not so much for the EMU.

The first issue of this kind to be considered is the influence of entrepot trade in the choice of monetary standard for small open economies. A theoretical three-country model is used to demonstrate that trade structure can substantially change the impact of

exogenous shocks on a small economy. More importantly, it is shown that the current structure of indirect trade between the United States (US), Hong Kong and China could reduce the opportunity cost of choosing between the US dollar and the renminbi as the nominal anchor for the Hong Kong dollar. The result undermines the net gain, if any, of switching the monetary standard of Hong Kong from the US dollar to the renminbi.

The second special issue to be examined is the interrelations between exchange rate arrangements, property markets, and the rest of the economy. A partial equilibrium analytical model and a general equilibrium simulation model are constructed to capture various institutional features of Hong Kong's property markets. It is established that the real impacts of monetary shocks on property markets are more prolonged than those on non-durable goods markets. Consequently, a fixed exchange rate regime, in general, exacerbates the business cycles of property markets and the economy as a whole. The simulation results indicate the attempt of the Hong Kong government to stabilize property prices during the Asian crisis, by suspending land disposal, might come at a cost of delaying economic recovery. The finding highlights the following dilemma: On the one hand, monopolistic control over land resource has opened up opportunities for the Hong Kong government to engage in supply side macroeconomic management, especially when the monetary instrument has already been committed to maintain the currency board system. On the other hand, the fixed exchange rate regime can magnify the impacts of land policies, raising difficulties and challenges in conducting counter-cyclical policies.

Finally, it is asserted that the greatest advantage of the prevailing currency board arrangement in Hong Kong is the credibility and stability the US dollar offers. Forasmuch as the renminbi is not yet convertible in its capital account and is largely untested for its credibility and acceptability, it can hardly provide an alternative monetary standard for Hong Kong in the near future. This thesis concludes that as long as Hong Kong can maintain its structural flexibility, the issue of the choice of the nominal anchor will be secondary to its future development.

TABLE OF CONTENTS

Chapter 4. Chinese Monetary Union: Part II

Chapter 5. Choices of Nominal Anchors & Entrepot Trade

Chapter 6. Property Markets & Exchange Rate Arrangement: Part I

Chapter 8. Conclusions

List of Tables

List of Figures

Chapter 6. Property Markets & Exchange Rate Arrangement: Part I

Chapter 7. Property Markets & Exchange Rate Arrangement: Part II

List of Abbreviations

Abbreviation (in alphabetical order)	
AD-AS	Aggregate-demand-aggregate-supply
AIC	Akaike's information criterion
B&Q	Blanchard and Quah
CEC	Commission of the European Communities
CES	Constant elasticity of substitution
China	Mainland China (unless specify otherwise)
CMU	Chinese Monetary Union
CPI	Consumer price index
DF test	Dickey-Fuller test
ECB	European Central Bank
EEC	European Economic Communities
EMU	Economic and Monetary Union
EU	European Union[1]
FDI	Foreign direct investment
GDP	Gross domestic product
HIBOR	Hong Kong Inter-bank Offered Rate
HSI	Hang Seng Index
HK$	Hong Kong dollar
HKMA	Hong Kong Monetary Authority
HKMC	Hong Kong Mortgage Corporation
HSBC	Hong Kong and Shanghai Bank Corporation
MFA	Multi-Fiber Arrangement
MFN	Most Favored Nation
NAFTA	North American Free Trade Area
NIC	Newly industrialized country
OCA	Optimum currency area
OPRT	Outward processing related trade
PBC	People's Bank of China
PP test	Phillips-Perron test
PRC	People's Republic of China
SAR	Special Administrative Region
SOE	State-owned-enterprise
US	United States
US$	US dollar
VAR	Vector autoregression
WTO	World Trade Organization

[1] With the Maastricht Treaty, the term European Economic Community has been replaced by the European Union, which refers to both a political and economic union.

Chapter 1

INTRODUCTION

Synopsis 1

This thesis is a collection of essays on the exchange rate arrangement of Hong Kong, focusing on the feasibility of unifying the Hong Kong dollar with the Chinese currency, renminbi. The analytical framework of the thesis is based on the literature of monetary unification, especially the studies of European Monetary Union (EMU). However, it goes beyond that to address some unique and important issues in the context of Hong Kong-China. These include the influence of entrepot trade on the choice of monetary standard, and the interaction between property markets and the exchange rate arrangement. This thesis brings some new perspectives to the existing literature and makes a number of contributions.

1.1 INTRODUCTION

This thesis is a collection of essays on exchange rate arrangements, with specific reference to the question of unifying or pegging the Hong Kong dollar with the Chinese currency, renminbi.

The topic is inspired by the political unification between Hong Kong and Mainland China (abbreviated as China henceforth unless stated otherwise). Since July 1, 1997, Hong Kong has become a Special Administrative Region (SAR) of the People's Republic of China. According to the Joint Declaration signed by the Chinese and British governments, Hong Kong will maintain a high degree of autonomy in all areas except foreign affairs and defense. In particular, the Declaration stipulates that Hong Kong can maintain its own currency and monetary system. Both Chinese and Hong Kong officials have declared that it is necessary to maintain the exchange rate linkage between the Hong Kong dollar and the US dollar after 1997; for example, see Sheng (1995) and Chen (1995). Practically, the renminbi is still not fully convertible in the capital account, let alone the question of becoming a widely accepted international currency. So, undeniably, in the short-term there is little room to alter the exchange rate regime of Hong Kong under the present political and institutional settings in both China and Hong Kong.

On the other hand, it is certain that the issue of linking the Hong Kong dollar with the renminbi will remain on the agenda in public discussion. Given that Hong Kong and China have become increasingly inseparable on most economic fronts, further unifying the Hong Kong dollar into the renminbi appears to be an inevitable and sensible future development. This perception has been nurtured by the fact that even without any policy coordination, a certain degree of monetary integration has already been achieved between the two economies. It is estimated that, about 22 to 25 percent of the total supply of Hong Kong dollars in 1994, equivalent to US$2.2 billion, was absorbed by China (Sung, Liu et al. 1996:233).[1] The main Chinese destination of Hong Kong dollars is, expectedly, Guangdong. Since the onset of the recent Asian financial crisis, the issue

[1] Another study put the figure at 30 percent for 1992, compared to just 6.9 percent in 1980 (Hong Kong Bank 1993).

has received even greater attention as the linked system between the Hong Kong dollar and the US dollar has been threatened by speculative attacks; for example, see EIU (1997).

In summary, the political reality will prohibit fundamental changes to the current exchange rate arrangement of Hong Kong in the short run,[2] whereas, in the longer run, economic forces are likely to continue to highlight the issue.

Due to the politics, what this thesis addresses appears to be a hypothetical issue. Notwithstanding, it is the first step in the rigorous analysis that will be required to address the prospect of monetary integration amongst the Chinese economies – China, Hong Kong, Macau, and even Taiwan. In addition, many aspects raised in this thesis are directly related to the current exchange rate arrangement of Hong Kong in which the currency is pegged to the US dollar.

1.2 SCOPE OF STUDY

Three issues about the exchange rate arrangement of Hong Kong are addressed:

- Is it economically sustainable to form a Chinese Monetary Union (CMU) between China and Hong Kong?
- Does the indirect trade between the US, China and Hong Kong affect the choice between the US dollar and renminbi as the nominal anchor for the Hong Kong dollar?
- How does the exchange rate arrangement influence the business cycles of the Hong Kong property market?

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[2] Mussa (1997:217) admits that "A stroll along the first floor corridor at the International Monetary Fund's Washington headquarters reveals the fundamental and indisputable fact that political considerations, rather than purely economic concerns, are the predominant practical determinants of the domain of operation of currency regimes."

1.2.1 Chinese Monetary Union: Part I

The study of monetary integration is copious and expanding rapidly. Most of the research efforts have been stimulated by and devoted to the European Monetary Union (EMU), and its predecessor the European Monetary System (EMS). This is not surprising, given the tremendous impact of the EMU on economic and political development in Europe, as well as its influence upon the broader international monetary order.

One of the most fundamental analytical frameworks of monetary unification is the optimal currency area (OCA) paradigm instigated by Mundell (1961), McKinnon (1963), and Kenen (1969). According to the OCA theories, a major disadvantage of joining a monetary union is the loss of individual monetary instrument for macroeconomic management. How critical the consequence heavily depends on the symmetry of disturbances experienced by the member states.[3] Other things being equal, the more synchronous their business cycles, the more sustainable it is for two economies to link their currencies together. A major contribution of the EMU literature is to quantify hitherto descriptive arguments of the OCA theories, including the symmetry of disturbances.

The literature of the EMU provides a useful starting reference point for this thesis. In Chapter 3, the question of whether it is economically sustainable for China and Hong Kong to form a CMU is raised under the OCA framework. The econometric modeling work of this chapter focuses on the symmetry of disturbances between Hong Kong and China; some prevailing methodologies from the EMU literature are adopted.

Sustainability is a relative instead of an absolute concept. Therefore, the empirical assessment of the CMU has to be conducted in a comparative perspective. In this aspect, the EMU can also serve as a benchmark for measurements, albeit whether itself constitutes an OCA has long been subject to debate.

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[3] Here "symmetry of disturbance" is an *ex post* concept. That is, it includes the symmetry of events occurring to the member states as well as the symmetry of impacts of the events upon them. The latter is determined by the economic structures and policy responses of the member states. Therefore, countries with more symmetric economic structures are more likely to be hit be symmetric shocks. For example, a rise in oil prices, which is an *ex ante* symmetric event to all countries, can cause *ex post* asymmetric disturbances to oil-importing countries and oil-exporting countries.

1.2.2 Chinese Monetary Union: Part II

Chapter 4 shifts the focus slightly from the Hong Kong-China context to China only. In most previous studies, China is treated as a single economic entity. Nevertheless, China covers a large area and has a massive population. In terms of fiscal autonomy, it consists of 30 provinces, municipalities, and autonomous regions (all simply denoted as "province" henceforth), not to mention numerous sub-provincial units. Most provinces are of geographical sizes comparable to, if not bigger than, an average European country. Most importantly, these sub-national economic units have highly diverse endowments, levels of development, and degrees of openness. Therefore, it raises the question of whether these heterogeneous Chinese provinces constitute an OCA.

This question has an important policy implication. An objective of economic reform in China is to establish a "socialist market economy" in which the market will substitute command-type control as a primary mechanism for resource allocation. Accompanying this transformation is a corresponding change of the macroeconomic management framework. For instance, establishing a financial market implies that the discretionary credit allocation policy in the past has to be replaced by a nondiscriminatory interest rate policy. As market-compatible monetary policy gradually resumes its function in economic management in China, the implication of this chapter falls into place. That is, the more China resembles an OCA, the more efficacious it is to use uniform monetary policy to smooth out macroeconomic vicissitudes in different regions as they occur.

This chapter reapplies the concepts developed in the previous chapter on the Chinese provinces by comparing various OCA criteria between China and the two most prominent economic unions – the US and the European Community. Likewise, the empirical part emphasizes on the symmetry of disturbances across the provinces.

1.2.3 Choices of Nominal Anchors & Entrepot Trade

While the EMU literature can provide a solid foundation for this thesis to lean on, the research agenda of the literature, particularly the empirical part, is largely bounded by the political and economic settings of the EMU. Therefore, strictly following this literature would risk overlooking some aspects that are unique and important for Hong Kong, but not necessarily for its European counterparts.

Two prominent features of the Hong Kong economy can be identified as 'neglected' issues in the literature of EMU, namely entrepot trade and the real estate economy.

In the literature, it is commonly asserted that if a small country decides to peg its currency to a foreign currency, it should choose the currency of its largest trading partner. The rationale is that a more stable exchange rate will promote trade and investment. Therefore, pegging to the largest trading partner will maximize the benefits. This merit comes with a potential cost that the fixed exchange rate regime will amplify the impacts of monetary disturbances from the anchor country. On the other hand, real disturbances from the anchor country will have their spillover effects dampened by the exchange rate peg. Such a trade-off is well presented in the classic Mundell-Fleming model.

Nonetheless, in almost all studies, direct trade is assumed and indirect trade is ignored. While this is a very reasonable assumption in the case of European countries, this is definitely not so for Hong Kong. In 1998, the total value of Hong Kong's re-exports was about 6.2 times that of direct exports. In terms of value-added, the contribution of re-exports to the gross domestic product (GDP) is about 2.7 times that of direct exports. It is postulated that Hong Kong, together with its primary trading partners, China and the US, constitutes the largest indirect trading bloc in the globe.

The distinct trade structure of Hong Kong brings a new perspective to the old topic of the choices of nominal anchors for small economies. Different from direct trade, entrepot trade involves at least three economies and, therefore, two exchange rates. Unless its trading partners peg their currencies together, an entrepot can not expect to gain the benefits of exchange rate stability on both sides. By the same token, the existence of indirect trading routes in parallel to direct ones can dramatically complicate the transmission mechanisms of disturbances across economies. For instance, for the case of three countries, direct trade involves six trading routes only; allowing entrepot trade will increase the number by two-thirds.[4]

To investigate this multi-dimensional interaction mechanism, a three-country indirect trade model is developed in Chapter 5. The model is instrumental in demonstrating how

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[4] The number of trading routes will increase by two-thirds if only one of the three countries is entrepot. If two or all three countries can serve as entrepots, the number will be even greater.

entrepot trade influences the impacts of exogenous shocks on a small economy under a fixed exchange rate regime. Most importantly, it can illustrate how indirect trade alters the opportunity cost of choosing one foreign currency instead of another as the nominal anchor for a small entrepot like Hong Kong. The analytical results are in contrast to some standard outcomes under the Mundell-Fleming model.

1.2.4 Property Markets & Exchange Rate Arrangement: Part I

Generally speaking, the EMU literature has given little attention to the impact of monetary unification on individual industries. The real estate sector is singled out in this thesis because of its distinct role in the Hong Kong economy. For example, about 40 percent of GDP and 50 percent of government revenue comes from property related activities. Due to land reclamation, hill terracing, and urbanization of rural areas, land supply is far from being inelastic in Hong Kong. Nonetheless, almost all land resources are statutorily monopolized by the government.

The special institutional setting in Hong Kong gives the authorities a policy instrument that is usually not available in other market economies: control over land disposal. This opens up a completely new perspective to macroeconomic management. Even if under currency unification the duty of combating asymmetric imbalances between member states does not weigh solely on the fiscal policy. This is demonstrated from the deployment of land supply policy to accommodate financial disturbances by the Hong Kong government during the recent Asian crisis.

Chapter 6 lays down the platform for studying the interrelations between land policies, property markets, the wider economy, and the exchange rate arrangement. First it gives a detailed account of the institutional and policy settings of Hong Kong's property markets. The changes of the government's housing and land policies before and after the hand-over, as well as its policy prescription for the Asian financial crisis are highlighted.

Then an intertemporal partial equilibrium model of property market is developed to illustrate some basic economic properties of real estate markets. The effectiveness of various housing and land policies as macroeconomic management instruments is examined with the help of the model.

1.2.5 Property Markets & Exchange Rate Arrangement: Part II

In Chapter 7 the partial equilibrium property market model developed in Chapter 6 is further extended into a multi-sector general equilibrium model. The model of this chapter incorporates many open economy elements and institutional features of Hong Kong's property markets, such as the coexistence of private and public housing markets.

This extended model is used to examine many theoretical issues left out in the previous chapter. They include the impact of property booms on the wider economy, the influences of the exchange rate arrangement upon the business cycles of property markets, and the effects of financial crisis on property markets. On the policy front, the economic implications of the Hong Kong government's land policy response to the Asian financial crisis are analyzed.

1.2.6 Background & Conclusions

This thesis consists of eight chapters, including this introductory one.

Chapter 2 is a background chapter. It provides a brief review of the Hong Kong economy. It includes the political settings before and after 1997, economic synergy with China, evolution of its comparative advantage, policy framework, and lastly the Asian crisis episode. More detailed information about individual issues like entrepot and property markets can be found in associated chapters.

Chapters 3 to 7 are fairly self-contained. They have their own abstracts, literature surveys, background materials and references.

Chapter 8 is the concluding chapter. It summarizes the findings of previous chapters, and draws from them some overall inferences and policy implications.

1.3 CONTRIBUTIONS OF THE THESIS

This thesis makes several contributions to the existing literature.

(i) Since the signing of the Sino-British Joint Declaration, discussion about the prospect of unifying the Hong Kong dollar into the renminbi has been going on.

Nevertheless, formal examinations of this scenario are rare. So far, the only serious attempt known to us is Chan (1996). This thesis takes a very different approach and covers many issues not explored by Chan or by the broader literature of monetary unification.

(ii) It is commonly realized that the Hong Kong and Chinese economies are structurally diverse but complementarily integrated. The former character implies the disturbances experienced by them are unlikely to be synchronous, while the latter suggests disturbances can be easily transmitted between the two, presumably from the big economy China to the small economy Hong Kong. This transmission mechanism is seldom put to empirical tests. An identifiable exception, Dodsworth and Mihaljek (1997), has touched this issue. This thesis addresses the question with a different methodology, and provides an answer with richer detail.

(iii) This thesis recognizes that China is an agglomeration of numerous heterogeneous provinces, and the economic integration between Hong Kong and China is highly biased towards the Pearl River Delta region. Therefore, besides national data, this thesis uses provincial data to examine the possibility of forming sub-national OCAs between Hong Kong and individual provinces, as well as between certain provinces themselves. No similar attempt to examine the macroeconomic divergence of Chinese provinces is known to us at the time of writing.

(iv) Entrepot trade is a unique feature of the Hong Kong economy. Understandably, studies about the relation between entrepot trade and the exchange rate arrangement are extremely limited. The only two noticeable publications are Tom (1989) and Tom (1964). However, these two studies not only refer to the situation for Hong Kong before the 1950s, but lack rigorous (in the mathematical sense) treatments. As a result, they fail to pin down the insights carried by the formal model developed in this thesis.

(v) While the economics of housing is a highly flourishing area in the economics discipline, the literature is overwhelmingly skewed towards the microeconomic perspective of property markets. Macroeconomic aspects of property markets, especially in relation to open economy issues, are largely overlooked. Morande (1992) and Matsuyama (1990) are two exceptional examples. Still, the general equilibrium property market model presented in this thesis is far more elaborated and instrumental to analyzing the interrelation between property markets and the exchange rate arrangement. This thesis represents one of the very first efforts devoted to understanding this interrelation.

The main findings in each of these areas are summarized in the concluding chapter.

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Chapter 2

Economic & Political Background

Synopsis 2

Economically and politically, China is the most influential external factor in the development of Hong Kong. The constraints in endowment and economic size make international trade essential for Hong Kong's prosperity. The hinterland provided by China has facilitated Hong Kong to evolve into an international trade and financial center. As a result, the two economies have been increasingly integrated into one. Domestically, positive non-interventionism remains the dominant philosophy in policy making, albeit the authorities have taken more initiatives in industrial development after the Asian crisis. The over-reliance of the economy on property-related activities has exaggerated the impact of the crisis. On the other hand, the prominence of the real estate sector implies that the government's monopolistic control over land disposal can be turned into a power supply side instrument for macroeconomic management.

2.1 INTRODUCTION

The exchange rate arrangement is a key component of the policy regime of an economy. Its role can not be appropriately assessed without first understanding the economy in which it is functioning. This chapter looks at the 'time-series' development of the Hong Kong economy as well as the 'cross-sectional' setting of its policy regime. A chronology of Hong Kong history is provided in Table 2.A1 in Appendix 2.

Measured before the Asian financial crisis, by all means the achievement of the Hong Kong economy was very impressive (Table 2.1). In 1997, its per capita GDP had already reached US$26,573, equivalent to 88.1 percent of that of the US, and only second to Singapore amongst the four Asian newly industrialized countries (NICs). In terms of the growth rate of per capita GDP over the period 1978-94, Hong Kong ranks last amongst the NICs, and eighth in the world (World Bank 1997). The economy is highly flexible. The non-accelerating-inflation-rate of unemployment was estimated to be just about 2 percent (Mihaljek, Hussain et al. 1998). The unemployment rate barely rose above the 3 percent level. Table 2.2 lists other economic achievements of Hong Kong that are always cited by the government as a showcase.

Nevertheless, the Asian crisis exposed some weaknesses of the economy. A foremost example being the extremely high dependency of fiscal revenue and equity values on property related activities. The performance of the economy is even more disappointing when compared to its 'rival' – Singapore. While located next to the worst hit Southeast Asian economies, Singapore was one of the least affected in the region. It recorded a positive year-on-year growth of 1.2 percent in the first quarter of 1999, after experiencing only two quarters of moderate negative growth (Porter 1999). In contrast, the economy of Hong Kong shrank by 3.5 percent in the same quarter (Saunders 1999). Sachs, Warner et al. (1999) assert that the exchange rate parity with the strong US dollar was a key reason why Hong Kong's recovery lagged behind that of Singapore, which revived through currency devaluation.

The distressing experience during the Asian crisis has raised questions in relation to what direction the economy should be heading in the future. On the one side, manufacturers have loudly criticized the strict practice of non-interventionism by the

Table 2.1: Comparative Economic Indicators (1997)

	Hong Kong	Singapore	Taiwan	South Korea	Japan	US	China
GDP (US$ bn)	172	89	283	438	4192	8080	917
Per capita GDP (US$)	26,573	31,035	13,153	9,530	33,213	30,147	742
Unemployment rate (%) [a]	2.2	1.7	2.7	2.6	3.4	4.9	3.1
Consumer price inflation (%)	5.7	2.0	0.9	4.5	1.7	2.4	2.8
Current account balance (US$ bn)	-6.6 [b]	14.0	7.8	-8.6	94.4	-166.8	29.7
Exports of goods (US$ bn)	188.1	125.9	121.7	138.6	409.2	680.3	182.7
Imports of goods (US$ bn)	209.2	124.7	107.	142.5	307.6	877.3	136.4
Foreign Trade (% of GDP) [c]	230.9	281.4	81.1	64.1	17.1	18.3	34.8
Average growth rate of real per capita GDP [d]	5.1	5.2	6.3	6.9	4.9	1.5	6.8 [8.0]
Foreign reserves (US$ m) [e]	63,833	76,847	88,038	34,037	216,648	64,040	139,901
Per capita foreign reserve (US$)	9,941	25,279	4,100	747	1,723	240	113
Area (sq. km)	1068	647.5	36,006	99,314	377,819	9,159,115	960,000
Population (mn)	6.50	3.04	21.68	45.5	126.2	268	1,236

Source: Country Reports of EIU, various issues, World Bank (1997), Singapore government (http://www.singstat.gov.sg/FACT/SIF/sif.html).

(a) Figure for China corresponds to official statistic of urban unemployment rate.

(b) Goods and services balance.

(c) Merchandise exports plus imports.

(d) The figures are estimated over the period of 1978-94. The figure in parentheses is from Chinese official statistics, the other one is the World Bank's estimation. The figure for Japan is estimated by the author, based on the data of International Financial Statistics, various issues.

(e) Figures of the last quarters (different months for different countries) of 1996.

authorities for hollowing out the industrial base of the economy. On the other, the government's decisions to stabilize the stock and property markets during the crisis spiked an outcry about the authorities deviating from the gospel of *laissez-faire*.

Table 2.2: Indicators of Hong Kong's Achievements in the World Economy

International trading center:

1. Ranked as the world's freest market by Heritage Foundation in 1997.
2. Ranked as the second most competitive economy after Singapore by World Economic Forum in 1998.
3. The eighth largest trading entity in goods in the globe in 1998, according to the World Trade Organization Report.
4. Reclassified as an advanced economy by the International Monetary Fund in 1997.

International financial center:

5. The second largest stock market, in terms of capitalization, in Asia after Japan. At the end of November 1998, the stock market capitalization was US$353 billion.
6. The sixth largest banking center in the world in terms of external banking transactions volume.
7. The seventh largest foreign exchange market in the world in terms of turnover, with average daily turnover reached US$79 billion in April 1998.
8. Its foreign reserves reached US$88.7 billion at the end of October 1998, the world's third largest.

International transport hub:

9. It has the busiest container port in the globe. Total container throughput in 1997 was 14.5 million Twenty-foot Equivalent Units.
10. It has the busiest international air cargo terminal in the world. The air cargo handling capacity was 1.78 million tones a year in 1997.
11. Its airport is the fifth busiest in the world in terms of international passengers. The number of passengers in 1997 was up to 28.3 million.

Source: The Information Services Department, Hong Kong Government (http://www.info.gov.hk/hkbi/enghkbi/4/topic4.htm).

This chapter does not aim to provide a roadmap for the future development of Hong Kong. Instead, it gives an overview of the economy and points out the concerns. Due to space limitations, the discussion is intended to be brief and selective. The next section provides the historical background of Hong Kong; Section 3 focuses on the economic linkages between China and Hong Kong; Section 4 reviews the development of the economy over the past few decades; Section 5 discusses the policy framework of the government; Section 6 looks at the problems arising from the Asian crisis and the response of the economy; and Section 7 concludes the chapter.

2.2 HISTORICAL BACKGROUND

Right from the beginning, the marking of Hong Kong onto the world economic map was all about China trade. In the late eighteenth century, China had already engaged in foreign trade, but in 1799, China decided to ban trade on opium, which was a major export of Britain. This event alerted Britain to decide to secure its own trade and commercial station in the Far East, and the 'trade conflict' degenerated into military confrontation. Hong Kong Island was abdicated to Britain in 1841, after China was defeated in the First Opium War (1840-42).

After the Second Opium War (1856-68), the Kowloon peninsula of the mainland, which is north of Hong Kong Island, was also abdicated to Britain. In 1898, to fence off the colony from aggression by other foreign powers heading down from the mainland, Britain forced China to 'lease' the New Territory, which is the vast area between Kowloon and the place now known as Shenzhen, plus 235 outlying islands for 99 years till 1997.

However, those treaties were never officially recognized by the People's Republic of China which was established in 1949. In the summer of 1982, China for the first time announced it would resume sovereignty over Hong Kong (including Kowloon peninsula and the New Territories) on July 1, 1997. After two years of negotiation, China and Britian signed an agreement that sealed the fate of Hong Kong – the Sino-British Joint Declaration. The core of the Declaration is that Hong Kong could enjoy a high degree of autonomy after 1997 except in foreign affairs and defense. Hong Kong can maintain its social, economic, legal and judicial, and legislative systems unchanged for 50 years after 1997. The term of 50 years is rather arbitrary, and Chinese officials have repeatedly stated that it is likely to be extended.

Based on the Joint Declaration, a mini-constitution of the Hong Kong Special Administrative Region (SAR) government – the Basic Law – has been formulated.[1] Both the Joint Declaration and the Basic Law are very explicit about the policy regime of the SAR. For instance, the Basic Law requires the SAR government to maintain the budget to be in line with GDP growth and a low tax system. On the monetary front, it states that the Hong Kong dollar remains as the legal tender. While the Basic Law does not explicitly adopt the prevailing exchange rate link with the US dollar, it maintains the issue of the Hong Kong dollar to be fully backed by foreign reserves. In brief, the Basic Law tries to preserve all the essential policy elements that were deemed by China to constitute the success of Hong Kong under British rule. Table 2.A2 in Appendix 2 summarizes the Basic Law provisions that shape the economic policies of Hong Kong.

2.3 CHANGING FACE OF THE HONG KONG ECONOMY

While Hong Kong may have gone through many changes, it is first and foremost a trade center. In 1998, Hong Kong was ranked the eighth largest trading entity in the globe in terms of value of merchandise trade; the fourth largest if trade within the European union is counted as internal trade.[2] In terms of value of services trade, it was ranked eleventh. Despite the increasing importance of the domestic market, trade remains a key driving force of economic growth.

At the outset, Hong Kong is bound to be open to trade, as it has virtually no natural endowment. The fishery and agricultural sector contributed merely 0.1 percent to GDP in 1997. As a result, domestic consumption relies almost entirely on imports. For the same reason, domestic production heavily counts on imported materials, capital goods and fuel. The extremely high degree of openness implies that the industrial structure is

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[1] A principle difference between the two documents is that the Joint Declaration is an *international* treaty honored by two sovereignties – Britain and China – and has been registered with the United Nations, while the Basic Law is a *domestic* legal document enacted only by China's legislative institute, the National People's Congress, in 1990.

[2] Details about the ranking and trade figures can be obtained from the web-site of the World Trade Organization (http://www.wto.org/wto/statis/stat.htm).

closely related to the trade pattern. This section traces the evolution of the economy in a changing environment (Table 2.3).

2.3.1 Phase I (1947-52): Intermediary of China Trade

During the post-war recovery period, the situation in Hong Kong largely resembled that in the nineteenth century. Positioned at the annex of southern China, Hong Kong naturally defined itself as a trading hub of China. Entrepot trade was the dominant activity, as there was virtually no domestic product exported. The manufacturing sector was developed mainly to facilitate entrepot trade, such as rope production, shipbuilding and repair, food processing and tin-refinement (Ho 1992).

2.3.2 Phase II (1952-70): Development of Domestic Exports

The economic structure of Hong Kong started to evolve when the People's Republic of China was established in 1949. Internally, China was more willing to trade with the former Soviet Union Bloc. But after diplomatic relations with the Soviet Union turned sour, China retreated into a policy of self-sufficiency. Externally, the engagement of China in the Korean War in the 1950s led to the imposition of trade embargoes by the US and the United Nations. Exports to China, which dominated Hong Kong's entrepot trade, fell by almost 70 percent during 1951-52, and China's share in Hong Kong's total trade declined from 39.3 percent in 1950 to 4.2 percent in 1956, and, further, to less than 1 percent by 1966 (ibid.).

While the changing of the international political landscape had truncated the entrepot trade of Hong Kong, it created other opportunities. The defeat of the Nationalists by the Communists in the late 1940s and subsequent numerous political movements in the mainland caused a continuous influx of refugees into Hong Kong.[3] These refugees came mainly from commercial centers like Guangdong and Shanghai, bringing not only a mass of cheap labor but also capital and entrepreneurial skills that formed the

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[3] It is estimated that half a million people migrated from China to Hong Kong over 1949-54, boosting the population by 27 percent (Leung 1993).

Table 2.3: Evolution of Hong Kong Economy

	1947-52	1952-70	1970-82	1981-96	beyond 1996
Changing environment	Post war recovery	Cut off of China trade Growth of US and European markets	Competition from NICs and other low-cost countries	Opening up of China's economy Increasing international competition	Gravity of development shifts from southern China to northern China Increasing competition from Singapore and Shanghai
Economic structure	Entrepot trade and services	Textiles Clothing Consumer electronics Plastics	Textiles and clothing Diversified consumer manufacturing goods Financial and business services	Entrepot trade services Financial and business services Fashion apparel and textiles Diversified consumer manufacturing goods Tourism	Conventional entrepot trade is gradually replaced by offshore trade and transshipment Others remain the same
Economic foundations	Excellent port Experienced international trade sector Extensive shipping and trade links	Transfer of capital and skills from Shanghai Migrant of low-cost labor from southern China	Low-cost labor Responsive physical infrastructure such as housing and transportation	Quality workforce Accessible technology Open and stable legal and regulatory system Forward-looking physical infrastructure Simple and low tax system	A prudently regulated financial market Others remain the same

Table 2.3: Evolution of Hong Kong Economy (continue)

	1947-52	1952-70	1970-82	1981-96	beyond 1996
Economic strategy	Exploit shipping and trading advantage	Labor-intensive industrialization	Export-oriented industrial diversification	Move to higher-value-added manufacturing Strengthen entrepot services Relocation of domestic manufacturing basis to China, especially Peal River Delta region	Exploit areas of technology-intensive productions Relocation of labor-intensive productions from southern coast to northern and western inland Shift of manufacturing basis in southern China to higher-value-added products Develop into a financial center for China enterprises' capitalization
Internal economic constraint	Weak domestic manufacturing base	Political instability in China	Raising labor cost	1997 uncertainty Brain drain due to massive migration Rising property prices	Deteriorating competitiveness due to high property prices Higher demand for welfare due to aging population and massive migrants

Source: Based on Leung (1993) and extended by the author.

foundation for the development of Hong Kong's domestic export industries, especially textile and clothing.

2.3.3 Phase III (1970-82): Consolidation of Manufacturing Sector

As the manufacturing base matured, the economy started to diversify its production to meet the challenge of intensifying external competition. Higher value-added products like consumer electronics and machinery were getting weights in Hong Kong's exports. At its peak in the early 1970s, the manufacturing sector contributed over 30 percent to GDP and employed nearly 50 percent of the labor force (Leung 1993).

Migration from China to Hong Kong largely stopped after 1951, due to China's closed-door policy. Illegal migration was common, and controls were loose initially as they were deemed a source of labor supply. However, in the late 1980s, the problem of illegal migrants became fierce, forcing the authorities to tighten control, effectively putting a brake on growth of the labor force. From 1987 to 1994, the annual unemployment rate was persistently below 2 percent (Sung 1998). The stringency in labor supply was soon translated into rising wages, a situation further exacerbated by surging rental prices due to the scarcity of land.

2.3.4 Phase IV (1981-96): Services-Based Center

The problems of a labor shortage and rising wages in the region had begun to erode the comparative advantages of all the Asian NICs in labor-intensive exports. In response, Singapore, Taiwan, and South Korea decided to promote capital- and technology-intensive exports to displace labor-intensive ones.[4] In contrast, Hong Kong reoriented itself towards service industries. This change, different from those in the other three Tigers, was not guided by government policies but by the market's invisible hands.

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[4] Singapore started to move toward high-tech manufacturing in the 1970s, much earlier than Taiwan and South Korea.

In the late 1970s, China reopened its economy. In view of lower labor and land costs, and investment incentives offered to foreign investors in the Peal River Delta region, Hong Kong manufacturers gradually relocated production across the border. It is estimated that by the end of 1991, in Guangdong alone, Hong Kong firms operated about 14,000 enterprises and employed about 3 million workers (Dodsworth and Mihaljek 1997). Employment increased to 6 million in 1997, equivalent to 20 times the entire manufacturing workforce in Hong Kong (Sung 1998).

A large proportion of those cross border investments was related to outward processing. Hong Kong manufacturers imported semi-products and then re-exported them to China for compiling. The processed products were then exported back to Hong Kong for final packaging before being re-exported to end-user countries.

Coincident with global financial liberalization in the 1970s, Hong Kong also started to reshape itself into an international financial center.[5] The number of banks jumped from 74 in 1977 to 165 in 1989, of which 134 were foreign banks. By 1991, Hong Kong was already established as the second largest financial market behind Japan in the Asia-Pacific region in terms of loan syndication, fund management, gold trading and stock market capitalization (Leung 1993).

The dynamism of the Hong Kong economy during this period is best illustrated by the composition of GDP (Table 2.4). In 1980, when China had just adopted its open-door policy, secondary industry contributed 31.7 percent to GDP in Hong Kong, out of which 23.7 percentage points were from the manufacturing sector. Since then, the share of manufacturing has shrunk steadily to 17.6 percent in 1990, and, further, to 6.5 percent in 1997. The reduction all went to the tertiary industry. Its share grew from 67.5 percent in 1980 to 74.5 percent in 1990, reaching 85.2 percent in 1997.

In terms of employment, the number for manufacturing fell by almost half during 1987-97, from 916,000 to 443,900.[6] However, industrial production index of the sector

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[5] For further discussion of this topic, see Hui (1992), Ho (1991), and Jao (1994).

[6] Data are from Table 2.1 "Employed Persons by Industry," Hong Kong Annual Digest of Statistics, various issues.

increased from 116.3 in 1987 to 126.3 in 1995, before sliding back to 120.6 in 1997.[7] This reflects the fact that mechanization, automation and relocation of assembly-type operations to the mainland have made room for the development of more knowledge-based and higher value-added manufacturing (Howlett 1998).

Table 2.4: GDP Composition of Hong Kong by Production (%)

Industry	1980	1985	1990	1993	1994	1995	1996	1997
Primary	**0.8**	**0.5**	**0.3**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**
Secondary	**31.7**	**29.9**	**25.3**	**18.5**	**16.4**	**16.1**	**15.5**	**14.7**
Manufacturing	23.7	22.1	17.6	11.2	9.2	8.3	7.3	6.5
Construction	6.6	5.0	5.4	5.2	4.9	5.4	5.8	5.8
Others	1.5	2.7	2.3	2.1	2.3	2.3	2.4	2.3
Tertiary	**67.5**	**69.6**	**74.5**	**81.3**	**83.4**	**83.8**	**84.4**	**85.2**
Sale & hotel [a]	21.4	22.8	25.2	27.0	26.2	26.6	26.7	26.1
Transportation [b]	7.4	8.1	9.5	9.5	9.7	10.1	9.8	9.3
Business services [c]	23.0	16.0	20.2	25.8	26.8	24.4	25.1	26.5
Social services [d]	12.1	16.7	14.5	15.7	15.9	17.3	17.6	17.4
Others	3.5	5.9	5.1	3.2	4.8	5.4	5.2	5.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/fasidx.htm).

(a) Sale and hotel services include wholesale, retail and trades, restaurants and hotels.

(b) Transportation includes transport, storage and communications.

(c) Business services include financing, insurance, real estate and business services.

(d) Social services include community, social and personal services.

2.3.5 Phase V (1996-): Global Control Room

By the year of the hand-over, Hong Kong had already evolved into the most quintessential service-based economy. The two largest sectors are financing, insurance, real estate and business services, and wholesale, retail and trades, restaurants and hotels.

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[7] Data are from Table 4.7 "Indices of Industrial Production," Hong Kong Annual Digest of Statistics, various issues.

The former contributed 26.5 percent to GDP in 1997, whereas the latter contributed 26.1 percent.

Services are important not only to domestic output, but also to external trade. In 1997, the total value of exports of services was equivalent to 25.7 percent of GDP, or 15.2 percent of that of exports of goods (Table 2.5); the corresponding figures for imports were 16.2 percent and 8.8 percent, respectively. Major trading services include transportation, travel and tourism, insurance, trade related services, financial and banking services.

Table 2.5: GDP Composition of Hong Kong by Expenditure (%)

	1987	1991	1993	1995	1997	Annual growth rate 1987-97
Private consumption	54.9	58.7	60.2	59.6	60.5	6.8 [a]
Government consumption	7.4	7.6	7.8	7.7	7.4	5.6
Public investment [b]	3.3	3.4	4.8	6.9	7.5	15.9
Private investment	22.1	25.7	30.7	36.7	48.7	15.3
Changes in inventories	2.1	0.7	0.3	5.3	0.4	-10.9
Exports of goods	81.5	122.7	147.9	167.0	168.7	14.5
Less: Imports of goods	82.6	125.5	153.2	181.5	184.3	15.5
Exports of services	24.0	24.3	25.8	26.3	25.7	6.4
Less: Imports of services	12.6	15.9	16.4	16.6	16.2	8.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**5.6**

Source: Table 17.2 "Gross Domestic Product Estimates by Main Expenditure Component" and Table 17.6 "Gross Domestic Fixed Capital Formation by Public/Private," Hong Kong Annual Digest of Statistics, various issues.

(a) The growth rate is the average annual growth rate.

(b) Public and private investments are the gross value of expenditure on construction, machinery and equipment, including real estate developer's margin, and transfer costs of land and buildings.

Between 1987 and 1997, the average annual growth rates of exports and imports of services in real terms reached 6.4 percent and 8.6 percent, respectively, compared to 5.6 percent of GDP. But the growth of trade of services was still behind that of trade of goods (14.5 percent for exports and 15.5 percent for imports). Despite this, in the run up to the next millenium, it is observed that the Hong Kong economy is entering another phase of structural change in which the former may gain greater momentum. Again, the China factor is the key catalyst for this transformation.

After almost two decades of economic reform, Chinese authorities have gradually shifted the focus of development from the southern to northern and western regions as a strategy to combat regional inequality. The preferential treatment previously enjoyed by the coastal region, such as foreign investment incentives, is now preserved for its inland counterpart. Secondly, as a consequence of economic advancement, labor costs in coastal regions have risen to a much higher level than that in the inland. Lastly, infrastructure like the port facilities in China has been greatly improved such that the reliance of Chinese exports on the shipment services of Hong Kong has been declining.

Witnessing these changes of comparative advantage between the Chinese provinces, Hong Kong manufacturers have started to relocate low-cost, assembly-type productions from the Peal River Delta region further inland, and to free up manufacturing capacity in the former for higher value-added production. Moreover, in response to the decline of its own comparative advantage in conventional entrepot services, Hong Kong has gradually shifted resources to transshipment and, further, to offshore trade (see Chapter 5). That is, Hong Kong is evolving into a control center for trade servicing and financing, directing flows of goods around the globe without being involved in the actual operation.

2.4 INTEGRATION WITH CHINA

Despite the political disconnection before 1997, and the institutional insulation after, economic integration between China and Hong Kong has been deepening since the opening up of the Chinese economy. A comparison of economic structure and human capital content clearly indicates the two economies are highly complementary to each other (Table 2.6). In terms of economic structure, Hong Kong was extremely skewed towards the tertiary sector. China's economy was relatively more evenly distributed, with the secondary industry taking up almost half of GDP in 1997. In terms of the densities of accountants and lawyers, the figure for Hong Kong was around 9 times that of China! In 1995, Hong Kong already housed 405 banks and branch offices, 1,300 accounting firms, and 3,000 management consulting firms; and nearly 800 foreign firms had set up headquarters in Hong Kong.

The next two subsections describe the trade and investment linkages between Hong

Kong and China.

Table 2.6: Economic Comparison between Hong Kong and China

	Hong Kong	China
Share of GDP (%) (1997)		
Primary	0.1	18.7
Secondary	14.7	49.2
Tertiary	85.2	32.1
Professional staff (per 100,000) (1995)		
Accountants	35	4
Lawyers	62	7
Share of labor force (%) (1997)		
Trade and commerce	30.3	12.1
Finance and insurance	12.7	2.0
Transport and communications	11.0	5.6
Services (total)	75.2	26.4

Source: World Bank (1997), Howlett (1997), and China State Statistical Bureau (1998).

2.4.1 Trade

Since 1978, commodity trade or visible trade between Hong Kong and the mainland has grown at an average annual rate of 28 percent (Howlett 1998). In gross value terms, China was Hong Kong's largest trading partner in 1997, and, reciprocally, Hong Kong was China's second-largest trading partner, second only to Japan. In 1997, China accounted for 36 percent of Hong Kong's total trade, including 90 percent of indirect trade; reciprocally Hong Kong accounted for 16 percent of the mainland's total trade (ibid.).

Nevertheless, a significant proportion of the two-way trade between Hong Kong and China has arisen from the outward-processing investment of Hong Kong firms in the mainland. If measured in finished products, the US was still the largest end-user market for Hong Kong's exports in 1996. In that year, 34.3 percent of Hong Kong total exports were absorbed by China, compared to 21.2 percent by the US. However, in terms of final goods, China actually only accounted for 21.9 percent, compared to 25.2 percent for the US (see Chapter 5).

2.4.2 Investment

In gross value terms, Hong Kong is the largest 'foreign' investor in the mainland. By the end of 1997, the cumulative value of realized direct investment from Hong Kong in China was estimated at US$121 billion, equivalent to about 55 percent of total foreign direct investment (FDI) in China (Howlett 1998). By the end of 1996, over 88 percent of the outward FDI of Hong Kong was channeled to China (Sung 1998).

Similar to the case of trade, the investment figures were exaggerated by the fact that a lot of capital flowing from Hong Kong to China originated from other economies. That includes capital from Taiwan to get around political barriers and "round-tripping" capital from the mainland itself to take advantages of foreign investment privileges.

In fact, Hong Kong's dominant share of FDI in China reflects the backwardness of the investment environment in the mainland. Lack of functioning investment rules and regulations means that kinship, language and cultural affinity have become the passwords to business opportunities.[8] When added to geographical proximity, Hong Kong has vast advantages over other foreign investors. However, as the policy regime in China matures in the future, the comparative advantage of Hong Kong is likely to diminish.

Secondly, when China first opened to FDI, it aimed to promote export oriented manufacturing industries. Since labor-intensive manufacturing firms tend to be of small to medium scale, Hong Kong investors were not in a disadvantaged position compared to their western counterparts. Moreover, western investors have been more interested in China's domestic market, especially the services sector, which China was very reluctant to open in the past. Notwithstanding, since Deng Xiaoping's southern tour in early 1992, China has progressively relaxed restrictions upon joint venture enterprises' participation in the domestic market, such as banking, real estate, tourism, shipping and aviation (Sung 1988). This is reflected in the fact that the share of services in inward FDI in China rose from 16 percent in 1992 to 27 percent in 1993, and further to 30

[8] Empirical evidence shows that sharing a common language can boost bilateral FDI flow by as much as 250 percent (Wei 1995).

percent in 1995 (ibid.). If China successfully enters the World Trade Organization, the liberalization of its services sector will surely be accelerated. As the services sector normally incurs significant economies of scale, giant western enterprises are likely to gain ground in this area.

Besides FDI, Hong Kong also has a significant role in channeling funds into China. For instance, among China's commercial loans, over 60 percent were syndicated in Hong Kong (ibid.). By the end of May 1997, 24 H-share stocks issued by Chinese state-owned enterprises had been listed on Hong Kong's Stock Exchange, with a market capitalization of US$6.9 billion (Ni 1994). On top of this, 50 listed Hong Kong companies have been controlled by China, with a market capitalization of US$49 billion, equivalent to 10 percent of the total value of the Hong Kong stock market (Sung 1998).

Reciprocally, China is one of the major 'foreign' investors in Hong Kong. By the end of 1995, China had invested a total of US$14 billion in Hong Kong, second only to the UK (Howlett 1998). About 1800 mainland enterprises have been established in the territory. Their investments are highly diversified, ranging from traditional areas such as trades, wholesale and retail, banking, transport and warehousing, to new areas like real estate, hotels, financial services, manufacturing and infrastructure development (ibid.).

An event that signified China as a major player in Hong Kong's financial market was the Bank of China Group becoming a note-issuing bank in May 1994, along with the Hong Kong and Shanghai Banking Corporation (HSBC) and the Standard Charted Bank. Since 1995 the other three major state banks, the People's Construction Bank of China, the Agricultural Bank of China, and the Industrial and Commercial Bank of China, have been granted banking licenses to operate in Hong Kong. The Bank of China Group has already become the second largest banking network in Hong Kong, only after the HSBC.

2.5 POLICY REGIME OF HONG KONG

The orientation of public policies in Hong Kong is "positive non-interventionism" – an akin of *laissez-faire* – coined by Philip Haddon-Cave, the Financial Secretary from

1971 to 1982:[9]

"[Positive non-interventionism] involves taking the view that, in the great majority of circumstances it is futile and damaging to the growth rate of the economy for attempts to be made to plan the allocation of resources available to the private sector and to frustrate operation of market forces which, in an open economy, are difficult enough to predict, let alone to control."[10]

"The implications of the adjective 'positive' are important: when faced with an interventionist proposal, the Hong Kong Government does not simply respond that such a proposal must, by definitions, be incorrect...in all cases, decisions are made positively, and not by default, and only after the immediate benefits and costs are weighed against the medium and longer term implications of the interventionist acts proposed (including the inevitable difficulties of unwinding them)."[11]

The positive non-interventionism philosophy has been translated into several policy guidelines, including prudent fiscal policies, a simple and low tax system, minimal government, and non-discriminatory industrial and trade policies.

2.5.1 Prudent Fiscal Policy

Fiscal policy is the up front defender of positive non-interventionism. Over the financial year period of 1984/85 to 1996/97, only the financial year 1995/96 recorded a deficit of 0.25 percent of GDP due to the peak spending on the Airport Core Program (Dodsworth and Mihaljek 1997). But on average, the government delivered a surplus equivalent to 2 percent of GDP across the whole period. By the end of financial year 1996/97, fiscal reserves had accumulated to 14.5 percent of GDP (Mihaljek, Hussain et al. 1998).

Hong Kong's fiscal policy is characterized by its frequently wrong estimation of the budget balance. This is largely because the stock and property markets in Hong Kong

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[9] In fact, Britain had started to implement the *laissez-faire* policy in Hong Kong soon after it colonized the island in the mid-nineteen century (Howlett 1998).

[10] Haddon-Cave (1984), cited from Leung (1993:9).

[11] Haddon-Cave (1982), cited from Dodsworth and Mihaljek (1997:23).

are generally volatile but the authorities tend to make a conservative estimation of the revenues from stamp duties on asset transactions and land sales (Dodsworth and Mihaljek 1997). As a result, stronger than budget-predicted activities in these two markets had envisaged an 'unexpected' windfall of revenues over many years until the outbreak of the Asian crisis (see Section 6). From the policy-makers' perspective, adopting a conservative scenario of revenue estimation helps deter demands for greater social spending, especially recurrent types.

Due to the conservative budget proceeding and the volatile nature of revenue sources, there is a tendency for the surplus to rise during booming periods and to fall during depressed periods. Therefore, from the revenue side, this helps to stabilize the economy, as the standard Keynesian type management. From the expenditure side, the self-imposed restraint implies that fiscal policies are barely counter-cyclical. Dodsworth and Mihaljek (1997) show that, over the financial year period of 1984/85 to 1995/96, the budget was largely neutral in terms of fiscal impulse. The only exception is that the investment peak on the Airport Core Program, which was up to 3 percent GDP, resulted in slightly expansionary effects in the following two years.

2.5.2 Minimal Government

Accompanying prudent fiscal policy is limited public spending. Government expenditure in Hong Kong is small as a percentage of GDP compared to OECD countries, mainly because of much more modest spending on social welfare and defense (ibid.). Before the hand-over, defense expenditure only took up about 0.1 percent of GDP; after 1997 the cost is fully borne by the Chinese government.

Social security programs in Hong Kong narrowly target the lowest income group, such as the elderly, the disabled and new migrants from the mainland. To maintain labor market flexibility, unemployment benefits are extremely scare and restrictive. To resist the pressure from political parties and the community to demand greater spending on social benefits, the government has committed itself to keeping the growth of public expenditure in line with GDP growth in the long run.[12]

A means to control growth of the public sector is marketization of government services. A "user pays principle" has been adopted for public utilities since the early 1990s, in that government departments charge the users of their services, including other departments within the government, to recover full operating costs (Ho 1999). A number of major public organizations have been incorporated so that they can be operated in market terms, such as the Mass Transit Railway, Housing Authority, Hospital Authority, and, coming up, the Hong Kong Mortgage Corporation.

2.5.3 Simple Tax System

The Hong Kong tax system is arguably one of the simplest with the lowest rate in the world. Salary tax is limited to not more than 15 percent of total income, and profit tax is flat at 16 percent. The tax base of Hong Kong is rather narrow. Income taxes, comprised of a salary tax and a profit tax, raised 40.3 percent of total revenue in the financial year 1996/97. Stamp duties plus several other internal taxes, together raised 16.6 percent of total revenue, whereas land sales, transactions and related interest earnings contributed another 14.2 percent. As pointed out by Dodsworth and Mihaljek (1997), the current narrow-based tax system worked well in the past because of continuous strong economic growth, along with the low administrative and compliance costs of the system, and the incentives it provides for domestic and foreign investors.

However, the Asian crisis has exposed the weakness of the system, in that public revenue relies excessively on equity and property market performance. Half of the total revenue is estimated to be property related (Granitsas 1999). In 1997/98, the downturn in the property market cut property related revenue by US$4.1 billion, equivalent to 14.6 percent of the original estimated total revenue (Tseng 1999). As a whole, the estimated budget surplus of US$1.4 billion in the financial year 1998/99 eventually

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[12] In annual budgets, the financial year 1986/87 is used as a starting point to measure the accumulated growth rates of GDP and public expenditure. Therefore, when measured on an annual basis, the growth rate of public expenditure can exceed that of GDP.

turned into a deficit of around US$4 billion. And the government forecasted the budget will not return to surplus until 2002/03 (ibid.).[13]

2.5.4 Non-discriminatory Industrial and Trade Policies

Coherent to the positive non-interventionism philosophy, the trade regime of Hong Kong is basically neutral to all domestic and external traders. Hong Kong is primarily a duty-free port and does not levy any tariffs on imports. Nevertheless, excise taxes are levied on some products, such as tobacco, cosmetics, alcohol, vehicles, and hydrocarbon oils. The purpose of these taxes is to raise revenue and fulfil specific policy objectives, like traffic control, environmental protection and health promotion. Hong Kong does not exercise any export or import quotas, with the only exception being the Multi-Fiber Agreement quota on textile and clothing exports.

The government has provided limited support for industrial development, including zoning land for general and specialized industrial use, and funding facilities for applied research. Basically the government tries not to 'pick winners' through any protection or subsidizing schemes.

Nonetheless, it is a fallacy to assume that *laissez-faire* is always the order of the day. For instance, all land resources are monopolized by the government, and property markets are dominated by a few big players (see Chapter 6). In the financial sector, the Hong Kong Association of Banks has acted like a cartel in control of interest rates via setting an "interest rate agreement" (Jao and King 1990). Most public utilities are either government-owned or controlled by franchised private corporations.

The Asian crisis has also prompted more government initiatives, if not interventions, in industrial development. In the 1999/2000 fiscal budget, the government proposed to establish a US$1.67 billion "Cyberport" to promote information multi-media industries. The tourism industry was also singled out as a legitimate sector for assistance. In addition to a US$64 million grant for a major tourism attraction Ocean Park, the

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[13] Despite the deficiency of the currency system, calls for widening the tax base were rejected by the Financial Secretary in his latest budget (see section 111-114 of Tseng (1999)).

government committed to access the feasibility of building a Disney theme park in Hong Kong (Tseng 1999). In mid-1999, the government further proposed a US$1 billion "Silicon Harbor" project to promote micro-electronic industries (Cheung 1999; Hui 1999).

2.6 LINKED EXCHANGE RATE SYSTEM & ASIAN CRISIS

Another important founding stone of Hong Kong's policy regime is the "linked exchange rate system." Soon after the change of sovereignty, the linked system was harshly tested by a financial crisis that ripped through Asia. This section elucidates the linked system, the impacts of the Asian crisis on it and on the economy as a whole, and what lessons can be learnt from the episode.

2.6.1 Linked Exchange Rate System[14]

The small but external-oriented nature of the Hong Kong economy makes nominal stability very desirable. This is revealed from the fact that, throughout its 150 years history, except for a ten-year period in the mid-1970s, Hong Kong has maintained certain kinds of fixed exchange rate regimes (Table 2.7).

The only free floating period of the Hong Kong dollar was between November 1974 and October 1983. The floating regime worked fairly well in the first two years after its adoption, with both inflation and the growth of money supply and bank credit being fairly stable. Nevertheless, after the second quarter of 1977, the money supply and credit expanded at a rate three to four times that of GDP (Jao and King 1990). This eventuated into a persistent depreciation of the Hong Kong dollar and double-digit inflation. An asset price bubble was formed in 1981 due to the huge influx of foreign capital. Over-exposure of the banking sector to property related loans set the scene for a financial crisis.

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[14] For references of the link exchange system in Hong Kong, read Nugee (1995), Dodsworth and Mihaljek (1997), Yam (1998), Kwan and Lui (1996), and Jao and King (1990). Schwartz (1993) and Balino and Enoch (1997) provide a comparative perspective on the topic.

Table 2.7: Exchange Rate Regime for the Hong Kong Dollar

Date	Exchange rate regime	Reference rate
Until November 4, 1935	Silver standard	--
December 6, 1935	Pegged to Sterling	£1=HK$16
November 23, 1967	(Same as before)	£1=HK$14.55
July 6, 1972	Fixed to the US dollar with ±2.25 percent intervention bands around a central rate	US$1=HK$5.65
February 14, 1973	(Same as before)	US$1=HK$5.085
November 25, 1974	Free floating	--
October 17, 1983	Link system to the US dollar	US$1=HK$7.80

Source: Nugee (1995).

The instability in the monetary front crashed with a confidence crisis aroused by the protracted and opaque Sino-British negotiation during 1982-84 over the future of Hong Kong. On September 24, 1983, the Hong Kong dollar dropped to HK$9.60 per US$1 and had lost 38 percent of its value measured in the US dollar since July 1982 (Dodsworth and Mihaljek 1997). Derivatives from the currency crisis included a stock market crash, a real estate price slump, and runs on small banks. To stabilize the Hong Kong dollar, the government announced the installation of a currency board system in October 1984.[15] Note-issuing banks were required to back the banknotes they issued by equivalent amounts of US dollars rated at HK$7.8 to US$1. Thereafter, the linked exchange rate system has constituted the backbone of Hong Kong's policy regime and the rate of HK$7.8 to US$1 has lasted up to the present day.

Using a structural vector autoregression technique, Kwan and Lui (1996) show that shifting from free floating to the currency board system reduces output volatility in Hong Kong by over 62 percent, and price volatility by 42 percent, but at a cost of lower output growth. They argue that the performance of the currency board has been greatly enhanced by the prudent and stable fiscal policy of the government.

[15] Another measure taken by the authorities was to lift the 10 percent withholding tax on interest earned from Hong Kong dollar deposits, equalized the positions of assets dominated in the Hong Kong dollar and in foreign currencies, respectively.

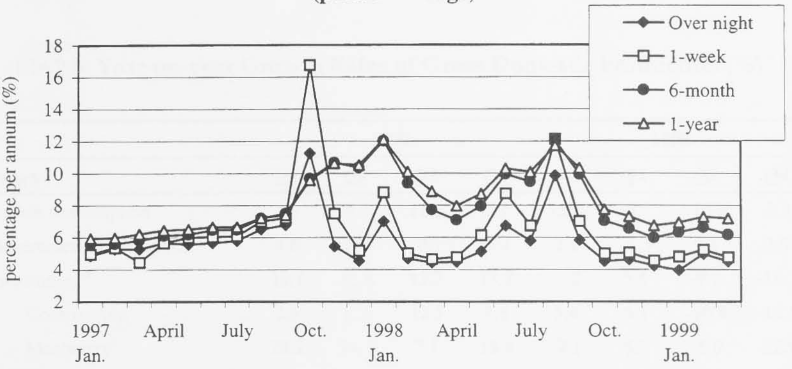
2.6.2 The Storm

Since its installation, the linked exchange rate system had seldom been challenged until the outbreak of the Asian financial crisis in July 1997. Basically, until the end of August 1998, the Hong Kong dollar was continuously under speculative attack. Each time the pressure was contained only after the Hong Kong Monetary Authority (HKMA) had purchased Hong Kong dollars from the foreign exchange market. When the supply of Hong Kong dollars contracted, liquidity in the domestic inter-bank money market was in shortage. The Hong Kong Inter-bank Offered Rate (HIBOR) was then driven up to reverse the outflow of capital and to equilibrate the inter-bank market (Figure 2.1). At a brief moment on October 23, the overnight HIBOR was hit up from 9 percent to 280 percent (Hong Kong Government 1998)![16] Feeling the pressure of high interest rates, the stock market fell by 10.4 percent, compared to 4.7 percent in Singapore and 3.4 percent in Kuala Lumpur (ibid.).

In August 1998, being aware of this interest rate defense mechanism, some speculators changed their strategies to "double market play." Speculators first borrowed Hong Kong dollars when Hong Kong dollar interest rates were relatively stable. On the other hand, they accumulated sizable short positions in the stock and futures markets. When they short sold their borrowed Hong Kong dollars in the foreign exchange market, Hong Kong interest rates were driven up – as anticipated. Therefore, as long as stock prices crumbled, even if the Hong Kong dollar was not devalued, the speculators could still gain from the stock and futures markets. The move of speculative funds was evidenced by the sharp rise in trading in stock index futures. In early August, the number of contracts of Gross Open Interest in spot Hang Seng Index (HSI) futures increased by over 30 percent, compared to that in June (HKMA 1999a).

[16] What caused the extraordinary interest spike on October 23 was the denouncement of the HKMA to charge a penalty rate on banks which "repeatedly borrow" through the Liquidity Adjustment Facility to meet the liquidity demand. But the authority did not specify the penalty rate and the definition of repeated borrowers till November 12. The uncertainty caused the banks to bid for Hong Kong dollars, which were simply not there, to settle their transactions.

Figure 2.1: Hong Kong Dollar Inter-bank Offered Rate (period average)



Source: Monthly Statistical Bulletin, Hong Kong Monetary Authority.

The attack intensified after mid-August. Based on the grounds that double market play is a manipulation of the system, the Hong Kong government decided to support share prices by purchasing equivalent to US$15.2 billion shares from all 33 constituent stocks of the HSI as well as HSI futures contracts. The maneuver was effective in frustrating double players, albeit it raised criticisms domestically as well as internationally that the authorities were walking away from non-interventionism. After August, HIBORs have eased quickly and significantly.

2.6.3 Counting the Wounds

The Asian crisis is one of the worst economic crises Hong Kong has ever experienced. GDP growth rate recorded –2.6 percent in the first quarter of 1998 – the first negative figure in ten years (Table 2.8). The recession hit the bottom at the third quarter, with GDP growth rate dropped to 6.9 percent on the negative scale.

Leading the fall was private consumption, which accounted for 60 percent of GDP (ibid.). Contraction in consumption was closely related to rising unemployment, a wage freeze, sharp decline in asset prices and thus wealth, high interest rates, and a gloomy economic atmosphere.[17]

Table 2.8: Year-on-year Growth Rates of Gross Domestic Production (%) [a]

	1997				1998			
Quarter	*Q1*	*Q2*	*Q3*	*Q4*	*Q1*	*Q2*	*Q3*	*Q4*
Private consumption	4.5	8.7	11.1	2.9	-2.6	-5.1	-10.0	-9.3
Government consumption	4.6	5.6	-0.1	-0.4	2.1	-5.3	3.8	2.5
Investment: [b]	19.7	15.8	13.7	13.7	-1.2	5.6	-9.2	-18.7
Construction	2.9	8.2	12.5	3.3	5.4	6.1	-10.8	-14.5
Machinery	28.2	14.1	7.1	19.4	-7.1	8.7	-6.0	-22.9
Exports of goods	4.0	6.2	4.4	9.6	1.4	-0.5	-7.0	-9.6
Imports of goods	6.4	6.9	7.1	8.2	-1.7	-1.8	-10.5	-13.5
Exports of services	4.4	1.9	-3.9	-5.8	-10.0	-11.4	-4.3	-1.1
Imports of services	4.3	-0.3	5.8	4.3	1.1	1.6	-2.6	-2.7
GDP [c]	**5.7**	**6.7**	**6.0**	**2.8**	**-2.6**	**-5.1**	**-6.9**	**-5.7**

Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/tgdp1.htm).

(a) Changes are measured in constant (1990) price.

(b) Investment is defined as gross domestic fixed capital formation.

(c) "Change in inventories" is omitted.

Export performance was also disappointing. But this was only partly ascribed to the disruption in the East Asian market, and perhaps more to the weakening import demand in China. In the second half year of 1998, the year-on-year growth rate of exports to China fell by 15.9 percent. The disorder in air cargo handling services in the new airport added to the poor export performance in July-August (Husain, Duenwald et al. 1999).

A huge fall in investment was recorded in the second half of 1998. This was the joint result of interest rate spikes, the completion of the Airport Core program, the downturn in property markets, and cautious market sentiment.

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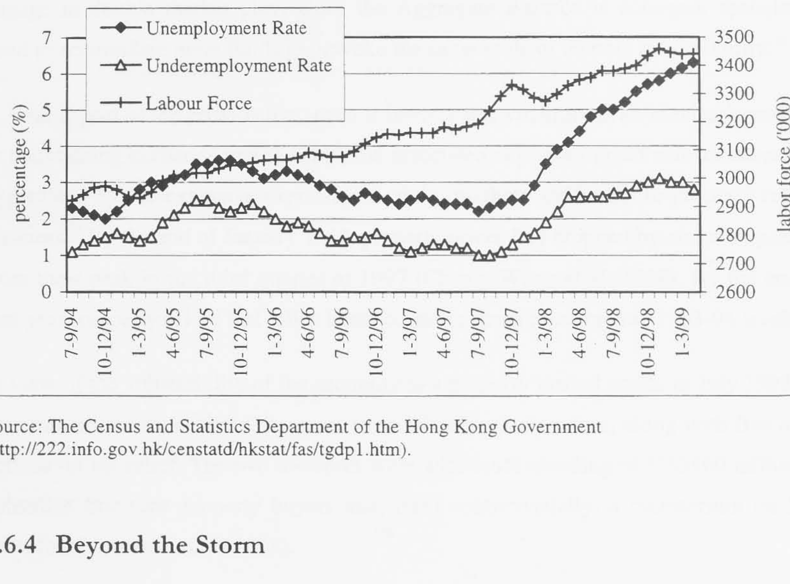
[17] It is estimated that a one percentage point increase in real interest rates lowers consumption growth by about 0.25 percentage point in the short run, and nearly 0.5 percentage point in the long run, as well as gross fixed capital formation growth by 0.4 percentage point (Dodsworth and Mihaljek 1997).

The impact of the crisis on the unemployment rate was disastrous (Figure 2.2). The unemployment rate rocketed up throughout 1998, attributed to downsizing and retrenching in the corporate sector. Also fueling the situation was a fast growing labor force due to housewives reentering the labor market, returned emigrants, and new mainland migrants (HKMA 1999a). By February-April 1999, the rate reached 6.3 percent, the highest in 17 years (Husain, Duenwald et al. 1999).

Figure 2.2: Three-Month Moving Average of Labor Market Data



Source: The Census and Statistics Department of the Hong Kong Government (http://222.info.gov.hk/censtatd/hkstat/fas/tgdp1.htm).

2.6.4 Beyond the Storm

In the light of the experience from the crisis, in September 1998 the HKMA announced seven measures to strengthen the linked exchange rate system (HKMA 1999b). A major provision is to broaden the scope of Convertibility Undertaking from three note-issuing banks to all licensed banks. This allows them to convert their Hong Kong dollars in the HKMA clearing accounts into US dollars at the official exchange rate. The provision simply aims to reinforce the authority's credibility in maintaining the peg.

The second major provision is to allow banks unlimited borrowing from the HKMA in respect of repurchase agreement transactions involving Exchange Fund Paper, which is fully backed by foreign reserves.[18] This is to remedy a shortcoming of the previous arrangement in that the size of the inter-bank money market, measured by the Aggregate Balance,[19] was too thin compared to the total money supply. In 1996, the Aggregate Balance was just equal to 0.25 percent of M1 or 0.026 percent of M3.[20] Consequently, movement of a small amount of funds could provoke volatile interest rate responses. And it was this kind of interest rate hike that provided speculators opportunities to engage in double market play. Once the Aggregate Balance is enlarged, speculators need to accumulate more funds to provoke the same scale of interest rate volatility.[21]

A clear aspect of the crisis is that, even if interest rate volatility is an inevitable tradeoff to maintaining exchange rate stability, the associated negative impact was unnecessarily aggravated by the excessive exposure of equity markets and banks to property related business.[22] By the end of January 1998, property prices had dropped by about 30 percent from their peak in the third quarter of 1997 (Cheng, Wong et al. 1998). By the end of that year, property prices had fallen back to, and in some cases below, 1993-94 levels.

In view of the vulnerability of the economy to a property market crash, in July 1998 the government announced two measures to stabilize property prices, along with five other actions on tax relief. The two measures were additional spending of US$460 million to subsidize first-time property buyers and, most controversially, a moratorium on land sales for six months (EIU 1998).

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[18] Repurchase agreement, or "repo," involves one party selling securities to another party, with an agreement to repurchase them on a specified date and at a specified price. The purpose of repo is mainly to smooth liquidity shortages in the inter-bank market, though it is also used by some central banks as a monetary instrument (Yam 1998). It was done through the Liquidity Adjustment Facility in the HKMA previously, and now through the Discount Window.

[19] The Aggregate Balance is the net balance in the clearing accounts maintained by banks with the HKMA for setting inter-bank payments.

[20] Figures obtained from the HKMA (http://www.info.gov.hk/hkma/) and the Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/).

[21] Besides, the authorities also tried to strengthen the operations in stock and futures markets. For details, see Hong Kong Government (1998).

[22] For example, see Charles Goodhart's letter in Hong Kong Government (1998).

The moratorium was disputable despite the legitimate need to safeguard the banking sector. This is because to regain competitiveness, the economy required a downward adjustment of prices and real wages, whereas the moratorium on land sales actually represents engineered sluggishness in asset price adjustment. The consequence is prolonging the recovery of the economy from the crisis-led recession.

Nevertheless, to a certain extent, this negative judgement about the moratorium is based on the presumption that the previous land disposal rate is (closer to) the optimal rate. Whether this is true is a complicated quantitative issue which goes beyond the scope of this thesis. Ho (1999), for example, provides a counter argument about the cause of the economic crisis in Hong Kong. He suggests the government's decision to allow public housing tenants to purchase their units at a highly subsidized rate upset the 'ecology of housing markets,' as it suddenly reduced demand in the private housing market. The excess supply of private dwellings dragged down property prices, curtailed activities in the construction sector, and thereby set off negative chain reactions in the economy. Therefore, Ho asserts that suspending land sales was the correct rescue policy.

2.7 CONCLUSIONS

Three reflections can be made from the discussion in this chapter.

Firstly, a portrait of development over the decades illustrates that China was the most influential external factor in the development of Hong Kong. The synergy between the two economies is reflected in their increasing interdependence in trade and investment. A follow up question is whether the integration between the two economies at the micro level replicates at the macro level in terms of correlation of business cycles. If this is the case, it is going to create a dilemma for Hong Kong in that, while its business cycles are influenced by those of China, under the linked exchange rate system its monetary policies are set (by the US) to mitigate those of the US.

Secondly, the constraints in natural endowment and economic size imply that international trade is the gateway to economic success for Hong Kong. In fact, the vast hinterland provided by China greatly facilitates Hong Kong to specialize into international trade and financial services. Nevertheless, openness comes with a cost of greater exposure to external shocks and, hence, higher vulnerability of the economy. This becomes more consequential when the monetary instrument has been surrendered under the currency board arrangement. As a result, other means have to be developed to alleviate the cost attached with international trade.

Thirdly, adherent to the principle of positive non-interventionism, the Hong Kong government has refrained from excessively flexing its muscle. Partly due to prudent fiscal policies, and partly due to the high degree of openness, Keynesian type fiscal tools are not considered to be very efficient for macroeconomic management in Hong Kong. In this sense, giving up the monetary autonomy is particularly costly. Notwithstanding, the Hong Kong government has an instrument which is not commonly available to administrations in other market economies – control over land disposal. This opens up the possibility of substituting monetary-based demand side macro management with a land-based supply side one.

These three aspects of exchange rate arrangement in Hong Kong are addressed respectively in the next five chapters.

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Appendix 2

Table 2.A1: Chronology of Economic and Political Events in Hong Kong

Period	Events
1839-42	Opium War between China and the UK.
August 29, 1842	Hong Kong island abdicated to the UK under the Treaty of Nanking (Nanjing).
1842-44	No formal monetary standard was adopted.
1844	The pound sterling standard was adopted
October 24, 1860	Kowloon Peninsula abdicated to the UK under the Treaty of Tientsin (Tianjin).
1863	The silver dollar standard was adopted.
1880	Major western industrial countries had already switched from the silver to the gold standard, including the US, Germany, France, the UK, Italy, and a number of European countries.
Late 1980s	Far eastern countries started to adopt the gold standard, for instance, Japan in 1897, India in 1899, and the Philippines in 1903.
June 9, 1898	New Territory was leased to the UK for 99 years under the Convention between China and the UK.
1935	China adopted the gold standard to avoid losing silver reserves. Hong Kong followed suit to abandon the silver standard. The pound sterling exchange paper standard was adopted consequently. It means Hong Kong adopted a currency board with sterling as the anchor currency.
1949	Sterling was pegged with the US$ under the Bretton Wood Accord.
1967	The peg between sterling and the US dollar was broken. The Hong Kong dollar depreciated against sterling, leading to massive capital outflows.
1968	Both the UK and Hong Kong participated in the Basel Accord.
1971	Bretton Wood system broke down, all major currencies started to float.
July 6, 1972	Hong Kong dollar fixed to the US dollar with ±2.25 percent intervention bands around a central rate
November 1974	The US dollar attacked globally, and depreciated against the Hong Kong dollar.
November 25, 1974	Hong Kong dollar began to float.

1974	Hong Kong experienced great inflation, low growth, and particularly volatile business cycles. The HSI index dropped 60.5 percent in 1974 and jumped 105 percent in the next year. GDP growth varied from 2.7 percent in 1975 to over 16 percent in 1976. Inflation swung from 2.7 percent in 1975 to 15.5 percent in 1980. The HK$ depreciated against the US$ from Hong Kong$5.1 in 1981 to HK$9.6 in 1983.
1978	China adopted an open door policy.
1982	China announced the intent to resume sovereignty of Hong Kong by July 1, 1997.
October 1983	Hong Kong readopted the currency board system, pegging to the US$ at a parity of HK$7.8 to US$1.
December 19, 1984	Sino-British Joint Declaration signed.
June 4, 1989	Crackdown of democratic movement in Tiananmen.
April 4, 1990	China's parliament, the National People's Congress, enacted the Basic Law of the Hong Kong SAR.
1992	Deng Xiaoping toured southern China and called for accelerating economic reform.
1993	H-shares started to list in Hong Kong's stock market.
May 1994	The Bank of China Group became the third note-issuing bank in Hong Kong.
July 1997	Hong Kong returned to China on July 1. Currency crisis in Asia emerged in the middle of the year. The newly established SAR government promised to build 85,000 housing units per year and raise home ownership from 50 percent to 70 percent of the population within ten years.
June 1998	The government announced a number of measures to stabilize property markets, including a nine-month moratorium imposed on land sales till the end of March 1999
August 1998	The government intervened in the stock market, purchasing US$15.3bn shares from domestic stocks.
September 1998	New measures were introduced to strengthen the Linked Exchange Rate system.
November 17, 1998	Government announcement to merge the reserves held by the Land Fund (US$27.1bn) into those held by the Exchange Fund (US$94.2bn).

Source: Tom (1989), Walters (1997), EIU (1998-99), Nugee (1995), Dodsworth and Mihaljek (1997), Kwan and Lui (1996).

Table 2.A2: Summary of Provisions of the Basic Law [a]

Item [b]	Chapter I: General Principles
General autonomy (2)	The National People's Congress authorizes the SAR to exercise a high degree of autonomy and enjoy executive, legislative and independent judicial power, including that of final adjudication, in accordance with the provisions of this Law.
Economic system (5)	The socialist system and policies shall not be practised in the SAR, and the previous capitalist system and way of life shall remain unchanged for 50 years.
Land and natural resource (7)	The land and natural resources within the SAR shall be State property. The Government of the SAR shall be responsible for their management, use and development and for their lease or grant to individuals, legal persons or organizations for use or development. The revenues derived therefrom shall be exclusively at the disposal of the government of the Region.
Language (9)	In addition to the Chinese language, English may also be used as an official language by the executive authorities, legislature and judiciary of the SAR.
	Chapter V: Economy
Property right (105)	The SAR shall, in accordance with law, protect the right of individuals and legal persons to the acquisition, use, disposal and inheritance of property and their right to compensation for lawful deprivation of their property.
	Such compensation shall correspond to the real value of the property concerned at the time and shall be freely convertible and paid without undue delay.
	The ownership of enterprises and the investments from outside the Region shall be protected by law.
Public finance (106, 107, 108)	The SAR shall have independent finances.
	The SAR shall use its financial revenues exclusively for its own purposes, and they shall not be handed over to the Central People's Government.
	The Central People's Government shall not levy taxes in the SAR.
	The SAR shall follow the principle of keeping expenditure within the limits of revenues in drawing up its budget, and strive to achieve a fiscal balance, avoid deficits and keep the budget commensurate with the growth rate of its gross domestic product.
	The SAR shall practise an independent taxation system.
	The SAR shall, taking the low tax policy previously pursued in Hong Kong as reference, enact laws on its own concerning types of taxes, tax rates, tax reductions, allowances and exemptions, and other matters of taxation.
Monetary and financial policies (109, 110, 111)	The Government of the SAR shall provide an appropriate economic and legal environment for the maintenance of the status of Hong Kong as an international financial centre.

	The Government of the SAR shall, on its own, formulate monetary and financial policies, safeguard the free operation of financial business and financial markets, and regulate and supervise them in accordance with law. The Hong Kong dollar, as the legal tender in the SAR, shall continue to circulate. The authority to issue Hong Kong currency shall be vested in the Government of the SAR. The issue of Hong Kong currency must be backed by a 100 per cent reserve fund. The Government of the SAR may authorize designated banks to issue or continue to issue Hong Kong currency under statutory authority, after satisfying itself that any issue of currency will be soundly based and that the arrangements for such issue are consistent with the object of maintaining the stability of the currency.
Foreign exchange policies (112, 113)	No foreign exchange control policies shall be applied in the SAR. The Hong Kong dollar shall be freely convertible. Markets for foreign exchange, gold, securities, futures and the like shall continue. The Government of the SAR shall safeguard the free flow of capital within, into and out of the Region. The Exchange Fund of the SAR shall be managed and controlled by the government of the Region, primarily for regulating the exchange value of the Hong Kong dollar.
Trade policies (114, 115, 116)	The SAR shall maintain the status of a free port and shall not impose any tariff unless otherwise prescribed by law. The SAR shall pursue the policy of free trade and safeguard the free movement of goods, intangible assets and capital. The SAR shall be a separate customs territory. The SAR may … participate in relevant international organizations and international trade agreements (including preferential trade arrangements), such as the General Agreement on Tariffs and Trade and arrangements regarding international trade in textiles. Export quotas, tariff preferences and other similar arrangements, which are obtained or made by the SAR or which were obtained or made and remain valid, shall be enjoyed exclusively by the Region.
Development policies (118, 119)	The Government of the SAR shall provide an economic and legal environment for encouraging investments, technological progress and the development of new industries. The Government of the SAR shall formulate appropriate policies to promote and co-ordinate the development of various trades such as manufacturing, commerce, tourism, real estate, transport, public utilities, services, agriculture and fisheries, and pay regard to the protection of the environment.

Source: The Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China (http://www.info.gov.hk/basic_law/english/index.htm).

(a) The text is directly extracted from the Basic Law, except that "Hong Kong Special Administrative Region" is replaced by "SAR."

(b) Numbers in parentheses are the original Article numbers.

Chapter 3

Chinese Monetary Union

Part I

Synopsis 3

This chapter examines the economic sustainability of forming a monetary union between China and Hong Kong by focusing on symmetry of disturbances. In general, certain European countries are found to be more correlated than Hong Kong and China. Hong Kong is correlated neither to its pre-1997 political sovereignty – the United Kingdom, nor to its long-term monetary sovereignty – the United States. However, if a two-quarter transmission time lag is allowed, then the correlation between China and Hong Kong becomes significant. The finding is consistent with the hypothesis that disturbances are transmitted from the big economy China to the small economy Hong Kong. Nevertheless, Hong Kong is not uniformly correlated to all Chinese provinces. The more open and developed provinces around the coastal line are found to be more correlated with Hong Kong than their inland counterparts.

3.1 INTRODUCTION

"If China catches cold, Hong Kong will suffer from pneumonia."

No other metaphor seems to describe the relationship between Hong Kong and China more sharply than this popular Hong Kong saying.. Behind the saying are two common viewpoints. First of all, Hong Kong and China are bonded together both politically and economically. Secondly, China has much more influence over Hong Kong than the other way round. The linkages between the two economies at the microeconomic level were depicted in detail in the last chapter. This chapter extends the analysis to the interrelation at the macroeconomic level. In the perspective of the exchange rate arrangement, the essential issue to be addressed here is, whether Hong Kong and China are integrated deeply enough to form a monetary union, namely the Chinese Monetary Union (CMU).

The extensive literature of currency unification, which largely associates with the European Monetary Union (EMU), indicates a broad range of issues of relevance. A substantial proportion of the literature is concerned with institutional and transitional issues of the EMU. To some extent, it is superficial to discuss those issues in the context of the CMU, as it is merely a hypothetical concept rather than one proposed for implementation. Therefore, to keep the discussion in focus, this study is confined within some general macroeconomic aspects of monetary unification. The study basically follows the paradigm of optimum currency area (OCA) which, although not without its own limitations, remains the most common analytical framework in this field.

The quantitative analysis focuses on symmetry of disturbances which, as argued below, is one of the most important convergence criteria in monetary unification. This is because if the member states of a monetary union are hit predominantly by synchronous shocks and their policy objectives are similar, one set of monetary instruments for the union is enough to manage all of their business cycles (Karras 1996). The cost of surrendering individual monetary autonomy will then be small; the union will hence be more sustainable.

Two aspects about the symmetry of disturbances between China and Hong

Kong are worth emphasizing.[1] On one side, due to substantial structural differences between the two economies, the probability that they will be hit by symmetric shocks could be fairly low. On the other, through their close economic linkages, disturbances in one economy could be easily transmitted to the other (Angeloni and Dedola 1999), conceivably from the big economy China to the small economy Hong Kong. Inasmuch as the two factors give opposite deductions about the correlation of their business cycles, the overall outcome depends on which factor dominates.

The structural vector autoregression (VAR) technique pioneered by Blanchard and Quah (1989) is used to measure the correlation of demand and supply shocks between China and Hong Kong. This technique has been widely adopted in the studies of monetary unification. This study makes two extensions in its application. Besides the contemporaneous correlation of shocks, it considers their lag correlation to test the transmission hypothesis mentioned above. Moreover, it acknowledges that China is a heterogeneous economy and its economic linkage with Hong Kong is highly biased towards the Pearl River Delta region. Therefore, the study disaggregates China into 30 provincial units in order to examine whether there are sub-national OCA within the greater China continent. Lastly, to put things in perspective, the study is conducted in comparative terms. The EMU is an obvious choice for the benchmark.

The remainder of the chapter is arranged in the following way. Section 2 reviews the literature of OCA theories; Section 3 looks at the limited application of OCA theories in the context of Hong Kong and China; Section 4 outlines the method for quantitative analysis; Section 5 discusses the estimation results and the last section concludes.

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[1] As mentioned in Chapter 1, "symmetry of disturbances" is an *ex post* concept here. It depends on the symmetry of events occurring to the member states in a union, as well as their reactions. The latter is determined by the symmetry of economic structures and policy responses between the member states. Insomuch as the vector autoregression model used in this chapter can not distinguish *ex ante* events from the responses of economies, an '*ex post*' interpretation of disturbance is more appropriate. On the contrary, if structural models are used, as is the case in Chapters 5 to 7, an '*ex ante*' interpretation of disturbances can be adopted.

3.2 OPTIMUM CURRENCY AREA THEORIES

Discussion of monetary unification in the literature has been conducted predominantly under the framework of OCA. The basic concept of the OCA paradigm is to find out what the optimal domain of a currency area should be. Studies of OCA can be roughly categorized into the criterion, cost-benefit, and modern approaches, respectively.

3.2.1 Criterion Approach

Initial discussion of the OCA paradigm in the 1960s was basically an extension of the debate between flexible and fixed exchange rate regimes. Optimality is measured with respect to conventional objectives of macroeconomic policies: full employment, external balance and a stable price level (McKinnon 1963).

The OCA paradigm primarily arises from the question of how to mitigate internal and external balances without nominal exchange rate (NER) realignments. Friedman (1953) suggests that regions with price and wage systems flexible enough to strike economic balances can maintain fixed exchange rates with each other. Thus, price and wage flexibility should be the first criterion to be examined in defining the domain of an OCA.

Nevertheless, flexibility is a relative rather than an absolute concept. Since the whole discussion of OCA is about how to minimize the need for NER realignments, price and wage flexibility should be measured against NER flexibility as a benchmark. Obviously, compared to asset prices, which can jump instantaneously, it is bound to conclude that commodity prices and real wages are sluggish.[2] Consequently, other factors (i.e. criteria) that can compensate, partially or completely, the rigidity of prices and real wages, are called in.

[2] Even if not put to such an 'extreme' of comparing with asset price movement, sticky price is widely considered practically relevant in economic studies. For example, see Obstfeld (1997b) and Blinder (1997).

The most commonly mentioned criteria include labor mobility (Mundell 1961), openness (McKinnon 1963), diversification (Kenen 1969), and convergence in inflation rates (Fleming 1971). The larger the extent to which these criteria are met, the smaller will be the need for NER realignments to maintain internal and external balances:[3]

- *Labor mobility*. Higher labor and capital mobility between regions can correct inter-regional imbalances by transferring labor from depressed regions to booming regions. This criterion, however, is deemed hard to satisfy. Evidence in some currency areas like the United States, Canada, and the former Western Germany shows that labor mobility between regions, or even between industries, is low in the short run (De Grauwe and Vanhaverbeke 1990; Eichengreen 1990a). Whereas it is exactly in the short run that prices and wages are rigid, so that high factor mobility is needed to reduce the cost of adjustment (Kawai 1994).

- *Openness*. Openness can be measured by the output ratio of tradable to non-tradable goods. It is likely that the more open an economy, the larger the proportion of tradable goods in price indexes. Consequently, NER change will have little effect on real wages or terms of trade.[4] In such case, monetary autonomy becomes immaterial. A caveat of this criterion is that openness comes along with exposure to external shocks, making it a double-bladed sword (Giersch 1973).

- *Diversity*. For a diversified economy, imbalances in individual sectors tend to cancel each other if sector-specific shocks are random. So, there is little pressure to correct the external balance at the aggregate level. Diversification also reduces the size of each industry compared to the economy as a whole, undermining the impact of individual sector-specific shocks. Corden (1994:133) gives a precise summary of this and the previous criterion in that "For the large, diversified economy, real exchange rate devaluation brought about by nominal devaluation is possible but not

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[3] For mathematical expositions of the above criteria, see Bayoumi (1992b) and Ricci (1997).

[4] Here terms of trade is defined as the ratio of a foreign tradable goods price index to the domestic price index. The domestic price index is composed of non-tradable goods prices and tradable goods prices. The latter is determined by world prices.

necessary..., while for the small, undiversified economy, it is necessary but not possible...."

- *Inflation convergence.* Surrendering individual monetary autonomy to a central authority implies a unified general inflation rate. If member states have different demands for seigniorage revenues or employment-inflation tradeoff, there may be conflicts in setting the centralized monetary policies. However, the availability of the employment-inflation tradeoff menu is highly conditional on the validity of a downward sloping Phillips Curve.[5] Therefore, some argue that harmonization of inflation rates is more a transitional problem than a one about sustainability (Vaubel 1978). On the other side, even if the employment-inflation tradeoff exists in the short run only, it is still indispensable once there is hysteresis in the natural rate of unemployment (Zis 1995).

Other criteria identified in the literature include fiscal integration (Scitovsky 1967; Ingram 1973), policy integration (Haberler 1970; Tower and Willett 1970), financial market integration (Ingram 1969), goods market integration (Mundell 1961), real exchange rate (Vaubel 1978), and economic size (Johnson 1973). The list goes on. As recognized by Vaubel (1978), the counting will hardly be completed, as in principle all factors that can shift the balance of payments should be included.

Although the list is seemingly inexhaustible, if one looks at the issue in reverse, various criteria can be brought under the same framework. As pointed out by Kawai (1994), if goods and factors markets are completely integrated globally, all prices and real wages are perfectly flexible, and trade is free from any barriers and transportation costs, the OCA will be the whole world and the usefulness of money will be maximized. In essence, the criterion approach is to restate one by one the assumptions of a perfect world like factor mobility, or to raise a remedy for the imperfection such as greater diversification and openness.

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[5] Long-term employment-inflation tradeoff definitely requires a downward sloping long run Phillips Curve. Short-term tradeoff between the variances of inflation and employment also requires a downward sloping short run Phillips Curve.

At the center of numerous criteria is indeed correlation of business cycles. This is because all OCA criteria are about adjustment without intra-union NER realignment. If the business cycles of member states are completely synchronous and their policy preferences are identical, there will be no intra-union imbalances; whether other criteria are fulfilled then becomes secondary.

A critical drawback of this approach is that it does not take into account the after effects of monetary unification, especially those arising from policy harmonization. In other words, it implicitly assumes the exogeneity of those criteria in the process of monetary unification.[6] Furthermore, few hints are provided about how to compare the measurements of various criteria, as well as the relative weightings between them. Unless a landslide majority of 'votes' emerges, working through a checklist of criteria will not deliver a concrete conclusion.

3.2.1.1 Empirical Evidence

In earlier empirical analysis of the choice of exchange rate regime, cross-country data of exchange rate regimes (i.e. the explained variable) are regressed against selective OCA criteria (i.e. explanatory variables) to verify their importance in choosing the regimes. A survey of six studies by Chan (1996) indicates that openness, production diversification, economic size, inflation convergence, and nature of disturbances are consistently significant in determining the choice of exchange rate regime.[7] Nevertheless, unless the principle of revealed preference is presumed, there is no guarantee that the prevailing exchange rate regimes are optimal.

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[6] This means that, in principle, studying monetary unification always requires a general equilibrium model that can pass the test of the Lucas Critique.

[7] The six studies are Branson and Katseli-Papaefstratiou (1981), Dreyer (1978), Heller (1978), Holden, Holden et al. (1979), Melvin (1985), and Savvides (1990).

The emergence of the EMU on the agenda of international monetary arrangements has stimulated plentiful empirical research on OCA theories. Though the results for the EMU are mixed.[8]

Inter-regional labor mobility, measured by the proportion of migrant workers in the total labor force, is two to three times higher in the US than in the European Community (EC) (OECD 1986). Eichengreen (1990b) finds that, in terms of dispersion of unemployment rates, the figure for the EC is double that for the US. Smaghi and Vori (1992) show that even the dispersion within individual EC member states has increased over time. The low mobility of labor in the EC is attributed to cultural and language barriers, as well as to incompatibility in social security systems.

European economies are open to each other and intra-EC trade has been promoted by the Single European Act (i.e. the 1992 program). Over half of the trade in the EC is between EC members, compared to one-third in the North America Free Trade Area (NAFTA). Nonetheless, in contrast to the argument of McKinnon (1963), the greater closeness of the EC does not result in stronger nominal illusion. It is evidenced that real wage rigidity rather than nominal wage rigidity prevails in European labor markets, whereas the opposite happens in the US.[9]

The diversification of manufacturing in the EC is found to be only about half of that in the US.[10] The US experience shows that market integration can lead to higher regional specialization underpinned by comparative advantage. On the other side, some argue that the dominance of intra-industrial trade in the EC indicates exploitation of scale economies being the major determinant of industrial structure, which should be intact under market integration. The moral is one can not take for granted the effect of

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[8] For recent surveys of this issue, see Eichengreen (1993), Obstfeld (1997), Wyplosz (1997), and Feldstein (1997).

[9] Based on the estimations of OECD (1989), Smaghi and Vori (1992) compute the indexes of real wage rigidity, which is defined as the ratio of the elasticity of nominal wage with respect to price over that with respect to unemployment, for a number of EC countries, the US, Canada and Japan. It is found that the index of the US is 0.22, while those of EC countries range from 1.0 (Belgium) to 6.8 (Germany).

[10] This is based on the calculation of Bini and Vori (1992), cited from Chan (1996). Also, see Helg, Manasse et al. (1995).

monetary integration on industrial structures and, hence, on the correlation of sector-specific shocks.

Lastly, inter-state fiscal transfer (indirectly through the federal budget) in the US is found to be about double that of inter-member fiscal transfer in the EC (Smaghi and Vori 1992).[11] Moreover, the transfer in the EC is more a means to redistribute incomes rather than to stabilize incomes, as the transfers are more concentrated on low-income countries like Portugal and Spain (ibid.).

Somehow, such a comparison with the US is 'unfair' to the EMU in the sense that the latter was established on January 1, 1999, while the former has been established since the late 1780s. Inasmuch as a single monetary system may promote inter-union economic integration, *ex ante* measurements can provide references but not necessarily verdicts about the optimality of a currency union in waiting. This, indeed, is related to the issue of endogeneity of OCA raised by Frankel and Rose (1996) (see below).

3.2.2 Cost-Benefit Approach

The criterion approach discussed previously assumes the benefits of monetary unification to be given, and endeavors to identify what factors (i.e. criteria) can help to lessen the costs.[12] And most of the concerns are about a single issue of losing individual monetary instruments to accommodate asymmetric shocks. Succeeding literature adopts a more comprehensive approach, contemplating the benefits as well as the costs of forming a monetary union. Likewise, issues other than idiosyncratic shock gain more and more attention.

Under the cost-benefit approach, the OCA paradigm becomes a notion of the *right* balance between the costs and benefits of monetary unification. When the marginal

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[11] A more recent study of Sorensen and Yosha (1998) also finds that both inter-state fiscal transfers and private capital market lending/borrowing smooth consumption in the US to a much larger extent than in the EC.

[12] To a certain extent, the degree of fulfillment of those criteria also has implications for the amount of benefits. For example, the criterion of openness is related to the benefit from more intensified trade under monetary unification.

benefit of having one more currency is just equal to the marginal cost, an OCA is formed. Earlier studies with this approach include Grubel (1970), Ishiyama (1975), Tower and Willett (1976). The approach still prevails in contemporary studies of the EMU, as seen in the reports of the Commission of the European Communities (CEC 1990; 1991).

The benefits of forming a currency union mainly come from the enhancement of the conventional functions of fiat money as a medium of exchange, a store of value, and a unit of account. In summary, monetary unification has the following benefits:

- *Transaction cost.* Currency unification can release the real resources previously deployed in foreign-exchange transactions for other uses. In the case of the EMU, the saving in transaction costs is estimated to be approximately 0.4 percent of the EC's GDP (CEC 1990).

- *Exchange rate risk.* Currency unification reduces intra-union NER and RER volatility and uncertainty. Various market instruments such as forward and swap contracts can also be used to hedge the exchange rate risk, but their own operations entail transaction costs. Besides, the long-term exchange position is hard to judge. So it is difficult to hedge long-term investment or trade against exchange risks when the sizes of those activities are functions of future exchange rates (Kenen 1997).

- *International currency.* A unified currency is likely to be a more prominent currency in the foreign exchange market than individual member currencies due to the size effect. It implies a greater bargaining power of the member states as a whole in international forums. If the unified currency is used more widely than individual currencies by non-member states as a foreign reserve currency, international seigniorage revenues will also increase as a result.

- *Trade and investment.* In the long run, a unified monetary system could have feedback effects on other aspects of regional economic cooperation such as intra-union trade and investment, especially long-term investment like infrastructure projects (Morsink and Molle 1991).

- *Price stability.* Abandoning national currencies guarantees relinquishment of competing monetary policies within the union. Provided that the central monetary authority is credible in pursuing low inflation policies, it will improve the stability of price levels and, thus, further reinforce production, trade and investment.

- *Foreign reserves.* It economizes the holding of foreign reserves for inter-union payments, as payment imbalances between member states will tend to cancel each other.

A criticism of the above discussion is in order. It is not entirely clear whose welfare the OCA paradigm is referring to (Melitz 1995). For instance, from the point of view of Eastern European economies, it may be 'optimal' to join the EMU, but from that of the qualified EMU members, it may be 'optimal' not to enlarge the union to incorporate transitional economies. This problem becomes more complicated with multiple possible combinations of union memberships.

Again, the primary cost of joining a currency union is the loss of individual monetary autonomy. This leads to several consequences:

- *Economic management.* Member states lose individual monetary instruments for macroeconomic management. This is particularly important if they are predominately hit by asymmetric shocks.

- *Fiscal flexibility.* Member states' long-term fiscal positions are constrained by monetary unification. Since money issuing is centralized by the union central bank, member states can not monetize their own debts (Bean 1992). Higher factor mobility in a common market, which is one of the OCA criteria, will further tighten the restriction. This is because a large public debt will signal factor owners about the possibility of higher future taxes. Therefore, it will prompt factor outflow, and contract the current tax base (Eichengreen 1993).

- *Seigniorage*. Member states will lose seigniorage revenues to the central money issuing authority.[13] But the net loss depends on how much of the centrally collected seigniorage revenues being redistributed to the member states. In 1988, the seigniorage revenues collected by countries with double digit inflation like Greece and Portugal were up to 2 to 3 percent of GDP, while those of over half of the EC countries were only around 0.5 percent of GDP (CEC 1990:120).[14]

- *External exchange risk*. Restricting the adjustment of NERs and RERs among member currencies may just shift the pressure to others, such as the exchange rates *vis-à-vis* non-member currencies (Fratianni and Hagen 1992). The consequence is that the benefits gained within the union may be neutralized, partly or wholly, by the losses made outside.

In summary, the ultimate economic advantage of monetary unification is to raise outputs through reinforcing intra-union trade, investment and competition. This, nevertheless, relies on the existence of a positive relationship between economic activities and exchange rate certainty. While such a lower-uncertainty-stronger-activities hypothesis is theoretically appealing, it is difficult to verify empirically. This is because relationships between variability and level variables are much less understood than those between level variables.

On the other hand, the major disadvantage of monetary unification is the loss of individual monetary instruments for macroeconomic management. The cost is determined by the usefulness of individual monetary instruments in ironing out business cycles. The cost is twofold. For risk-averse economic agents, their welfare will directly be reduced due to greater volatility in consumption. Besides, stronger business cycles may have adverse impacts on growth, counteracting the benefits from lower volatility in

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[13] Sinn and Feist (1997) consider a special issue of transitional gains/losses of seigniorage amongst the EMU members due to conversion of reserves (bonds, gold, international currencies and alike) into euros. They find that countries with relatively large monetary bases such as Germany, the Netherlands and Spain could lose per capital wealth of 182 to 406 ecus.

[14] The flow amount of nominal seigniorage revenue is simply equal to that of money creation. The volume of real seigniorage revenue lost by a member state expressed as a proportion of GDP, is equal to the growth rate of nominal money supply divided by the velocity of circulation (Bean 1992).

exchange rates (Ramey and Ramey 1995). Both impacts, again, rest on relationships between variability and level variables.

Consequently, unless the connections between variability and level variables can be clearly defined, exact measurements and comparison of the costs and benefits would be arduous to carry out.[15] This difficulty is well summarized by Wyplosz (1997:18):

"Assessing the cost and benefits of monetary union quantitatively is both frustrating and useless. It is frustrating because, frankly, as economists we are unable to compute them with any precision, and we owe it to the profession to admit so in public. Our understanding of monetary and exchange rate policy is regrettably limited, and the lack of a precedent leaves us with more conjectures than certainties. Moreover, quantitative estimates are useless unless they are sized up against the costs and benefits of the relevant alternatives, which is equally beyond our current ability. The best that can be done in this situation is to gain an understanding of where the costs and benefits are likely to reside."

3.2.2.1 Empirical Evidence

Notwithstanding all the difficulties mentioned above, limited empirical evidence does exist. CEC (1990) is an ambitious attempt to quantify the net gain of the EMU. But it is criticized as overstating the best scenario to justify the economic desirability of the EMU. The empirical result of Frankel and Rose (1996) casts some doubts on the conventional wisdom of OCA theories in that the OCA paradigm can be an endogenous result, rather than a prior condition, of monetary unification. They establish that trade integration can enhance the correlation of business cycles between partner economies, undermining the usefulness of individual monetary autonomy in a monetary union. This concept of endogeneity of OCA also gains support from Molle and van Mourik (1988), who show that labor mobility is fostered by, among others, trade linkage.

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[15] This echoes the views of Obstfeld (1997b), Bean (1992), and the Swedish Government Commission on the EMU (1997).

On the other side, a survey study by the International Monetary Fund concludes that there is no concrete association between short-run exchange rate variability and trade (IMF 1984). Frenkel (1992) also finds that the impact of exchange rate uncertainty on trade is marginal, with a doubling of the standard deviation of RER associating with a 0.7 percent reduction of trade volume.[16] Eichengreen (1993) ascribes this result to the buffer effects of forward markets. These findings are important, because if the linkage between exchange rate stability and trade volume is not warranted, then that between monetary unification and synchronization of business cycles will also be discounted. Notwithstanding, the impact of monetary unification on trade and investment could come from the harmonization of institutional and policy settings rather than from exchange rate certainty.

3.2.3 Modern Approach

Following the unsuccessful implementation of the EMU in the earlier 1970s, the OCA paradigm faded out from the debate of international monetary arrangements. However, with the return of this international monetary architecture in the 1980s, OCA has emerged into the limelight again. While the prevailing analytical framework remains the cost-benefit approach, economists have attempted to incorporate more dynamic elements into traditional static analyses. Such efforts are indeed a reflection of the development of modern economic theories such as game theory, rational expectation, and endogenous growth, as well as of the practical issues arising from the launch of the EMU.

For instance, under the Solow-Swan growth model, given a constant saving rate, higher efficiencies of resource allocation due to sharing a common currency will result in an outward expansion of the production frontier. But it only generates a medium-term growth during the transitional period from the old to the new frontier. However, endogenous growth models predict a much larger gain. Using an increasing returns-to-

[16] This is cited from Eichengreen (1993).

scale and a profit-motivated innovation growth model,[17] Baldwin (1989) estimates that the dynamic impacts might amplify the benefits of the 1992 program by as much as 450 percent!

Whereas precise quantification of the impacts of monetary unification is still beyond reach, recent advancements in empirical techniques do allow researchers to explore this territory more than ever before. Examples include the econometric modeling works of Cohen and Wyplosz (1989), Bayoumi and Eichengreen (1994a; 1997), Whitt (1995), and Hartley and Whitt (1997); the multicountry general equilibrium modeling efforts of Masson and Symansky (1993), Fair (1998), McKibbin and Bok (1995), and Gagnon, Masson et al. (1996); and an unconventional genetic approach of Ghosh and Wolf (1994).

Furthermore, the launch of the EMU opens up a bunch of strategic, transitional, spatial and institutional issues of monetary unification. Specific topics include independence of central banks, motivations for dominant and peripheral countries to join a currency union, and multi-speed approaches of unification; for example, see Beetsma and Bovenberg (1998), Ghironi and Giavazzi (1998), Kenen (1995), Baldassarri and Mundell (1993), and CEC (1990; 1991).

In practice, the EMU membership requirements spelled out in the Maastricht Treaty emphasize more about policy credibility and convergence than structural compatibility like openness or diversification. The four admission conditions include convergence in the inflation rate, convergence in the long-term interest rate, stability in the NER, and sustainability in public finance.[18] These apparently fairly rigid admission conditions are to safeguard a smoother transition to the EMU and to lower the risk of compromising

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[17] For details of these models, see Romer (1987a), Romer (1987b), Grossman and Helpman (1988a) and Grossman and Helpman (1988b).

[18] Explicitly, the four admission provisions are as follows (Kenen 1995; Klein 1998):

(i) the inflation rate does not exceed by more than 1.5 percent that of the three best performing states;

(ii) a member state does not unilaterally devalue its currency against any other members' currencies at least in the previous two years;

(iii) the long-term interest rate does not exceed by more than 2 percent that of the three members with the lowest inflation rates in the previous year; and future centralized monetary policies (Klein 1998). Notwithstanding, they are not completely well received. Proponents of the opposite fast-track approach assert, under the belief of monetarism, that if the European Central Bank (ECB) is independent a painless adjustment process can be immediately achieved, leaving the convergence criteria redundant (Wyplosz 1997).

Among the four criteria, fiscal convergence becomes an increasingly disputable issue. Dornbusch (1997) argues that the requirement of fiscal consolidation is unnecessary, insofar as the provisions of independence for the ECB and of no bailouts of public debts sufficiently shield monetary policies from poor fiscal management. De Grauwe (1996) holds a similar view that member states should be allowed to equip with fiscal instruments for macro management, and the market will impose disciplines upon them, as evidenced in the debt performance of state and municipal governments in the US. Nonetheless, Wyplosz (1997) points out that market failure does exist and correctional reactions of the market tend to be abrupt. The request of Italy for a "temporary" departure from the budget deficit criterion a few months after the launch of the euro in January 1999, to a certain extent, demonstrates the (over) stringency of this convergence condition.

In summary, the launch of the EMU has widened the scope of monetary unification studies from conventional OCA theories to incorporate institutional and political economic issues. Equipped with contemporary economic theories, the modern approach puts far more emphases on the interaction between member states, and that between private agents and policy makers. Thus, it is the inclusion of individual agents' reacting behaviors that gives rise to a richer dynamic dimension in the modern approach of monetary unification analysis.

(iv) the budget deficit does not exceed 3 percent of GDP, and the government debt does not exceed 60 percent of GDP.

3.3 CHINESE MONETARY UNION

3.3.1 Is Hong Kong an OCA?

As shown previously, most empirical applications of OCA theories are based on the EMU. Some exceptions exist. Bayoumi and Eichengreen (1994a) and Ghosh and Wolf (1994) have a global perspective; Bayoumi and Eichengreen (1994b) focus on the NAFTA trio; Horvath and Grabowski (1997) apply the theories to the African continent; and Chan (1996) analyzes the exchange rate arrangement of a sub-national economy – Hong Kong. In particular, Chan (1996) is the only OCA study with reference to Hong Kong that is known to us to date.

The theme of Chan (1996) is very similar to this study, though the focus is different. Chan lists nine OCA criteria to test whether Hong Kong should adopt a floating exchange rate regime, and if not, which currency area it should join. Five currencies are selected in his study as the candidate nominal anchors for the Hong Kong dollar, including the renminbi, US dollar, pound sterling, Deutschmark and Japanese yen. Three countries in the US dollar zone and 12 countries in the French franc zone are used for comparison (abbreviated as Z15 henceforth).[19]

The results of Chan seem to clearly reject the hypothesis of Hong Kong being an OCA. For instance, Hong Kong has a very internationally mobile labor force, though outward migration is driven more by political factors. In the early 1990s, about 35 percent of the population in Hong Kong was born in China and another 5 percent in other countries. Hong Kong is also home to a large number of foreign workers on a temporary basis, including domestic helpers, unskilled workers, and professionals. With the opening up of the Chinese economy, there are increasing numbers of Hong Kong people, mostly professional and businesspersons, working in China. In the early 1990s, migrant workers

[19] The 12 countries in the FF zone are: Chad, Mali, Niger, Burkina Faso, Togo, Central African Republic, Benin, Cote d'Ivoire, Senegal, Cameroon, Congo, and Gabon; the three countries in the US dollar zone are: Panama, Venezuela, and Oman.

made up about 7 percent (5 percent incoming and 2 percent outgoing) of the total labor force (ibid.).

Secondly, as an international trading hub, Hong Kong is extremely open. In 1997, it ranked fourth in world merchandise trade and fourteenth in commercial service trade.[20] Its trade to GDP ratio is much higher than those of the Z15. In terms of export and production diversification, which are measured in terms of both market and product concentration, Hong Kong is also among the top band of the Z15, but falls short of having the best performance (ibid.).

Furthermore, financially, Hong Kong is highly integrated with the rest of the world. This is reflected from the status of Hong Kong as an international financial center, the presence of major international financial institutes, and completely free global capital transactions.

On the other hand, the findings of Chan about the choice of the optimal nominal anchor for the Hong Kong dollar are not that definite. Out of the nine criteria, two favor the renminbi (labor mobility and political linkage), one the Japanese yen (inflation convergence), and four the US dollar (openness, financial integration, symmetry of disturbance, and RER variability). The remaining two criteria are neutral for this question (diversification and economic size).

Overall, the proposition of Hong Kong being an OCA is firmly rejected by Chan. This finding justifies the motivation of this study. Notwithstanding, there is room for further investigation about the choice of the nominal anchor for the Hong Kong dollar. This is because, firstly, the results in Chan's study are not overwhelmingly conclusive, although the US dollar seems to have the most favorable position.

Secondly, as recognized by Chan, many OCA studies simply start with national boundaries and, therefore, overlook the possibility of having sub-national OCAs. To a certain extent, Chan falls within his own criticism. Given the size of China, the diversity

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[20] Merchandise trade includes both domestic and re-exports. Ranking and trade figures can be found in the web-site of the WTO (http://www.wto.org/wto/statis/prerelease.htm).

of development in different regions, and, most importantly, the bias in economic integration between Hong Kong and the southern provinces, treating China as a homogenous entity is not unquestionable.

Thirdly, in analyzing symmetry of disturbances, Chan deploys the decomposition technique of Cohen and Wyplosz (1989). The method is to extract error terms from autoregressions of macroeconomic data like GDP, and interpret the sums of the error terms for two economies as symmetric shocks, and their differences as asymmetric shocks. This method is, nevertheless, criticized as atheoretical (Giovannini 1989). Most crucially, the method does not distinguish between disturbances and responses. As pointed out in CEC (1990:284), macroeconomic fluctuations are "the outcome of a combination of the working of the economy and policy intervention. To the extent that the latter are unexpected, they also act as shocks and therefore as a source of macroeconomic fluctuations." Inasmuch as policy interventions to exogenous disturbances are likely to be harmonized or restricted under currency unification, filtering out policy-induced impulses from the measurements of business cycles becomes necessary in assessing the viability of a candidate currency union. This issue becomes even more prominent in the case of Hong Kong with the presence of a currency board arrangement. Given that the currency board restricts the interest rate and monetary policy discrepancies between the US and Hong Kong, the method adopted by Chan might be biased favorably towards the US dollar at the outset.

3.3.2 Symmetry of Disturbances

In view of the limitations of Chan (1996), this study aims to analyze the issue of symmetry of disturbances at a deeper level. This study does not repeat the estimations of other criteria in Chan's study, because the methods of measuring those criteria are relatively indisputable, and the results in Chan (1996) are quite sensible.

Beside the insufficiencies mentioned above, there are good reasons why the issue of symmetry of disturbances deserves special attention. As argued previously, a major cost of forming a monetary union is the loss of individual monetary instruments. The size of this cost depends on three factors: (i) flexibility of prices and real wages; (ii) symmetry of disturbances between member states; and (iii) similarity of policy objectives between them. Even if prices and real wages are sluggish in the short run, as long as synchronous shocks dominate idiosyncratic shocks and the member states' policy objectives are comparable, one set of monetary instruments is still sufficient to manage the business cycles for all the member states. Therefore, the economic stress of surrendering individual monetary autonomy will be small. In a word, other things being equal, the more symmetric the disturbances between the member states are, the more sustainable the union will be.

The diverse impacts on various European countries of the oil crisis in the 1970s and those of German unification in the early 1990s well demonstrate the practical significance of symmetry of disturbances (Mussa 1997). In the case of the EMU, the fiscal consolidation provision in the Maastricht Treaty, which limits the scope of manipulation of fiscal policies, raises the importance of synchronization of disturbances between the member states even further.

The next sections estimate the symmetry of disturbances between China and Hong Kong. To benchmark the measurements, the symmetry of disturbances between a number of European countries is estimated too. Furthermore, considering the vast differences between various parts of China, this study also examines the symmetry between Hong Kong and individual Chinese provinces.

This study aims to distinguish supply and demand disturbances. Presumably supply shocks are determined relatively more by structural elements, while demand shocks more by policy innovations (Bayoumi and Eichengreen 1994a). Thus, the former conveys more relevant information than the latter about the sustainability of a monetary union in waiting.

There are two competing elements in determining the symmetry of disturbances between China and Hong Kong. On the one hand, the two economies have very dissimilar economic structures. In 1997, about 19 percent of China's GDP came from primary industry, 50 percent from secondary and 32 percent from tertiary. In Hong Kong, primary industry almost does not exist, whereas tertiary industry accounts for over 85 percent of GDP. The discrepancy in economic structure implies that they are unlikely to be hit by symmetric sector-specific shocks.

On the other hand, the two economies are deeply integrated and complementary (see Chapter 2). This is reflected from the fact that they are the largest trading and investment partners of each other in gross value terms. This connection implies that disturbances from one economy can easily be transmitted to the other, perceivably from the big economy China to the small one Hong Kong.

In summary, the structural divergence between the two economies implies that their business cycles are unlikely to be correlated; the transmission channel, however, gives an opposite deduction. Consequently, the overall outcome depends on which competing factor dominates. Testing this hypothesis is the centerpiece of the following quantitative analysis.

In fact, the above hypothesis has already gained support from the empirical works of Dodsworth and Mihaljek (1997) and Husain (1997).[21] Dodsworth and Mihaljek measure the correlation of business cycles between the US, Hong Kong, and China with output gaps in annual terms (Table 3.1). Output gap is measured by the difference between actual GDP and potential GDP; the latter is basically a measure of disturbance-freed growth trend.

From Table 3.1, it can be seen that over 1978-85, 1985-91, and 1991-96, the business cycles between Hong Kong and China have been increasingly synchronized, and so are those between China and the US. Husain (1997) shows that the correlation between the cyclical components of Hong Kong's GDP and industrial production in China rose from about –0.2 in mid-1986 to about 0.9 in early 1992, but then gradually declined to 0.6 by 1996.

Secondly, the correlation between the US and Hong Kong was greater than that between China and Hong Kong before the 1990s, but the latter doubled the former during 1991-96. Dodsworth and Mihaljek (1997) suggest this is a result of the on-going economic integration between Hong Kong and China. On the other hand, division of labor between the two economies enables Hong Kong to specialize in service industries.

[21] The empirical work in this chapter had been finished before the two studies were published.

Dodsworth and Mihaljek (1997) argue this explains why the amplitude of the business cycle (i.e. the standard deviation) of Hong Kong became so distant from that in China, but increasingly comparable to that of the US.

Table 3.1: Correlation of Output Gaps between Hong Kong, China & the US

	1978-85	1985-91	1991-96
Correlation between output gaps [a]			
Hong Kong-China	-0.51	0.07	0.63
Hong Kong-US	0.13	0.43	0.34
China-US	0.67	0.75	0.88
Standard deviation of the output gap			
Hong Kong	3.17	3.36	0.54
China	2.99	3.92	3.02
US	2.61	1.31	0.57

Source: Table 3 of Dodsworth and Mihaljek (1997).

(a) Output gap is a measure of output fluctuation, equal to the difference between actual GDP and potential GDP. The latter is estimated by applying the Hodrick-Prescott filter to annual GDP data in constant prices over the period 1961-1996.

Despite the results of the two studies seeming to be very supportive of the hypothesis put forward in this study, a drawback must be pointed out. That is, like the analysis of Chan (1996), their measurements do not distinguish between exogenous impulses and policy innovations and, therefore, could be biased by the prevailing currency peg between the US and Hong Kong.

3.4 QUANTITATIVE ANALYSIS

This section is to explain the quantitative method deployed to identify individual shocks from time series data. The estimation results are reported in the next section.

A common empirical definition of shocks is deviations from a predictable trend. But there is little consensus about which decomposition methods are preferable. The method used in this study is one of the most common decomposition techniques in the literature, pioneered by Blanchard and Quah (B&Q) (1989). The method is to use VAR technique to decompose disturbances in output and price (or unemployment rate) into two kinds of shocks, namely demand and supply shocks.

The B&Q method is adopted partly because high frequency time series macroeconomic data for China were limited at the time of writing. Therefore, it has to confine the analysis within a bivariate system.

As a member of the VAR model family, the B&Q method has the general advantages of avoiding simultaneity and exogeneity problems. Besides, a specialty of the B&Q method is worthwhile highlighting. Unrestricted VAR models are commonly criticized as atheoretical on the one side (Cooley and LeRoy 1985). Traditional well-structured simultaneous equation models are challenged as imposing "incredible identifying restrictions" on the other (Sims 1980:4).[22] The B&Q method attempts to strike a balance between these two 'extremes' by imposing minimal restrictions on a bivariate VAR. In particular, only one long run restriction is imposed on output; the short run dynamic of output and all dynamics of price are not restrained. These restrictions allow one to link the VAR model with structured macroeconomic models, especially the aggregate-demand-aggregate-supply (AD-AS) model, which is already a workhorse in macroeconomics.

3.4.1 Blanchard and Quah Decomposition

If a vector of variables X_t is stationary, it can be represented by a vector moving average representation:

$$X_t = A_0 u_t + A_1 u_{t-1} + A_2 u_{t-2} + \ldots$$

$$= A(L) u_t, \tag{3.1}$$

$$E(uu') = I.^{23}$$

[22] For a brief review of relationship between VAR and structural modeling, see Diebold (1998) and Clements and Mizon (1991).

[23] Constant, time trend, seasonal dummies and other dummies can be added if necessary. The discussion will be invariant to those additional variates.

u_t's are the vectors of structural shocks of interested. $A(L)$ is a matrix polynomial of lag operators, and matrixes A_j's (j = 0, 1,...) are the impulse responses of X_t to u_{t-j}'s respectively. $E(uu') = I$ is an imposed condition. Restricting the variances of the structural shocks to be one is just a normalization process. Restricting all the covariances to be zero implies that the structural shocks are orthogonal.

u_t's are not directly observable. However, the representation (3.1) can be recovered by estimating a vector autoregressive representation of X_t:

$$X_t = B_1X_{t-1} + B_2X_{t-2} + \ldots + B_nX_{t-n} + \ldots + e_t$$

$$= e_t + C_1e_{t-1} + C_2e_{t-2} + \ldots, \qquad (3.2)$$

$$E(ee') = \Omega.$$

where e_t is a vector of estimated errors.

While equations (3.1) and (3.2) look very similar, the latter can be estimated directly from the data, but not the former. This difference arises from the fact that the elements of u_t are required to be uncorrelated contemporaneously, whereas no such restriction is imposed on e_t.

Notwithstanding, (3.1) and (3.2) must be connected in a certain way, as they are merely different representations of the same data generating process. In fact, comparing (3.1) and (3.2) gives

$$u_t = A_0^{-1}e_t \qquad (3.3)$$

$$A_j = C_jA_0. \qquad (3.4)$$

To convert e_t's back to u_t's, and to obtain A_j's, it is necessary to identify the matrix A_0. Consider the case that X_t has only two elements: change of output (Δy_t) and change of price (Δp_t).[24] In this bivariate system, A_0 has four elements, so it requires at least four

[24] In the case that the price level is I(2), Δp is replaced by $\Delta^2 p$.

restrictions to identify it. The first three restrictions are indeed the normalization and orthogonality conditions. They can be denoted by:

$$A_0 A_0' = \Omega .^{25} \tag{3.5}$$

The last restriction is that one of the components of u_t, say u_{1t}, has no long run impact on output (y). The long run impact on output is equal to the sum of the impacts on Δy_t from time zero to infinity. Since the impact of u_{1t} on Δy_t after j periods is equal to a_{11}^j. The long run neutrality restriction on u_{1t} can be represented by:

$$\sum_{j=0}^{\infty} a_{11}^j = 0 . \tag{3.6}$$

The restrictions (3.5) and (3.6) provide four linear equations that can be solved for the four elements in the matrix A_0. Hence, the series of structural shocks, u_t, can be fully recovered by equation (3.3). After recovering the series of structural shocks for individual economies, the correlation of shocks between different economies can be calculated.

3.4.2 Structural Shocks

The interpretation of structural shocks basically depends on the number of variables and the imposed restrictions. For a system with n variates, generally no more than n shocks can be decomposed.[26] In other words, in the above bivariate system, even if there are many different types of shock hitting an economy, they can be distinguished into two broad categories only.

Recall that four restrictions have been imposed upon the system to make it identifiable. The first two are merely normalization conditions, giving no economic meaning to the structural shocks. The third restriction is that the two structural shocks are mutually

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[25] Since $e_t = A_0 u_t$, $E(ee') = A_0 E(uu')A_0' = A_0 I A_0' = \Omega$.

[26] Nevertheless, this is not an absolute rule. Hartley and Whitt (1997) use a generalized method of moments model to identify demand, supply, transitory, and permanent shocks from a bivariate system.

uncorrelated contemporaneously. Although possessing no explicit economic meaning, this restriction upholds the robustness of the interpretation of the results (Cooley and LeRoy 1985). If this assumption is invalid, then the *estimated* structural shocks are essentially linear combinations of the *actual* but correlated structural shocks. The consequence is that one can hardly derive economic meanings from the estimated shocks and, thus, their impulse response functions (Pagan 1990).

The fourth restriction is the soul of the B&Q method. This one restricts one of the structural shocks to have zero impact on output as time tends to infinity. Under the AD-AS model framework, the shocks with transitory impacts on output are identified as demand shocks, and those with permanent impacts as supply shocks. Some others interpret them as monetary and real shocks respectively, for example Kim and Enders (1991) and Lastrapes and Selgin (1994). The naming of the structural shocks is irrelevant, but the names chosen by different authors reveal the underlying assumptions about the sources of the shocks. These two interpretations merely assume respectively that transitory shocks are dominated by demand or nominal shocks, while permanent shocks are dominated by supply or real shocks.

However, the above interpretations are not immune from challenges. The identification rule will break down if demand or nominal shocks have permanent impacts on output. This situation arises when, for instance, hysteresis of unemployment rate is taken into account, subjective discount rates are influenced by demand disturbances, and production exhibits non-constant returns to scale properties.[27]

While the demand-supply interpretation shares this potential drawback with the nominal-real one, there is a built-in mechanism in the B&Q method to verify whether the demand-supply interpretation matches the data. According to the AD-AS model, a positive demand shock will cause an increase in price, while a positive supply shock a decrease in price. Since no restrictions have been imposed on the parameters of the price

[27] However, B&Q show that as long as these permanent effects on outputs due to demand disturbances are small compared to the effects of supply disturbances, the identification rule is still approximately correct.

equation in the estimated VAR, the impulse response function of price can be used to verify the presumption of the underlying model.

3.4.3 Data

Besides China and Hong Kong, two groups of countries are examined. The first one consists of the G3: Japan, the US, and, Germany. The second one consists of nine European countries, including France, Italy, the United Kingdom (UK), Spain, Greece, Austria, Switzerland, the Netherlands, and, again, Germany, referred as the E9.

The G3 is used as a control group to capture any global disturbances. If the correlations of disturbances between the G3 are significant, then strong correlations between other countries might just be a result of international business cycles, rather than that of regional connections (Bayoumi and Eichengreen 1994a).

The E9 serves as a benchmark for comparison. Different kinds of countries have been included in the E9 such that the CMU can be compared with both core and peripheral European countries. In terms of the size of the economies, Germany, France, Italy, and the UK are large economies, and the rest are small economies. Spain and Greece are less developed, compared with the others. Switzerland is not a member of the EMU, though by all means it is a core European country; Greece was not qualified at the first round admission; and the UK opted out of the EMU at the first round.

GDP and GDP deflator are used for all countries wherever they are available. Manufacturing output and consumer price index (CPI) are used in the case of Greece. Industrial output and retail price index are used in the case of China. Appendix 3 provides more detailed descriptions about the data.

3.4.4 Unit Root and Cointegration Tests

Before estimating a VAR, it is necessary to ensure that its components are stationary and not cointegrated.[28] The augmented Dickey-Fuller (DF) and Phillips-Perron (PP) tests are deployed for stationarity and cointegration tests. The PP test is a generalization of the DF test, allowing very mild autocorrelation and heteroskedasticity in the error term. The results are reported in Table 3.2.

Table 3.2: Summary of Unit Root Tests of CMU, E9 and G3

Country	DF tests of y	PP tests of y	DF tests of p	PP tests of p	Cointegration Tests
China	I(1)*	I(0)	I(2)*	I(1)	Not cointegrated
Hong Kong	I(0)	I(1)*	I(2)	I(1)*	Not cointegrated
US	I(1)	I(1)	I(1)	I(1)	Not cointegrated
Japan	I(1)	I(1)	I(2)	I(2)	Not cointegrated
Germany	I(1)	I(1)	I(2)	I(1)*	Not cointegrated
France	I(1)	I(1)	I(2)	I(1)*	Not cointegrated
Italy	I(2)	I(1)*	I(2)	I(2)	Not cointegrated
Spain	I(1)	I(1)	I(2)	I(1)*	Not cointegrated
Greece	I(1)	I(1)	I(2)	I(1)*	Not cointegrated
UK	I(1)	I(1)	I(2)	I(1)*	Not cointegrated
Austria	I(1)	I(1)	I(1)	I(1)	Not cointegrated
Netherlands	I(1)	I(1)	I(1)	I(1)	Not cointegrated
Switzerland	I(1)	I(1)	I(1)	I(1)	Not cointegrated

(a) Asterisk (*) denotes the order of integration adopted in the case the two tests give different results.

For output, it is reasonable to expect that the order of integration would not be more than one. Only the DF tests of Hong Kong and Italy give unexpected results. Therefore, it should be acceptable to take the outputs of all the countries as I(1).

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[28] If they are cointegrated, an error correction term must be added. For further discussion of this issue, see Lastrapes and Selgin (1994).

For prices, both I(1) and I(2) are plausible. If a price is I(1), a disturbance will cause a permanent change in the price level, but the long run inflation rate will remain zero. If the price is I(2), an innovation will cause a permanent change in the long run inflation rate. Supposing real money demand is determined by the level of real natural output and the velocity of money is constant, then a one-off shock will trigger a permanent change in the inflation rate only if there is a feedback effect from the disturbance to the money supply. An example is that the monetary authority tries to stabilize the real output. Therefore, when one decides what order of integration of prices of various countries should be taken, it is making inferences on their monetary policies.

For Japan and Italy, the two tests give consistent results, so their prices are simply taken as I(2). Likewise, the prices of the US, Austria, the Netherlands, and Switzerland are taken as I(1). For Hong Kong, the price is taken as I(1) as suggested by the PP test. This is because, as the Hong Kong dollar was pegged to the US dollar during the sample period, Hong Kong's monetary policy was exogenously determined by that of the US. This is also consistent with the finding of Kwan and Lui (1996).

For China, the result of the DF test is adopted so that its price is I(2), since the PP test result of the output is quite unusual. There is some supporting evidence of its price being I(2). Despite economic reform in China's financial market, it is observed that credit allocation is still partially determined by political considerations, particularly at the local level (Blejer, Burton et al. 1991). State-owned-enterprises are continuously treated generously in the allocation of credits in order to maintain employment and workers' living standards (Blejer, Burton et al. 1991; Spiegel 1994). In a sense, the money supply in China is endogenized by targeting the employment rate and real wages.

For Germany, the choice was to take the price as I(1). This is because the Bundesbank is well known for its anti-inflation reputation. Therefore, taking the price as I(2) would be inconsistent with this fact. For France, Spain, Greece, and the UK, no particular inferences are drawn on their monetary policies, and they are simply taken as I(1).

As the results of integration test of price for some countries are not conclusive, it is useful to state here that in practice the sensitivity of the VAR estimations has been tested by taking China's price as I(1), and those of France, Spain, Greece and the UK as

I(2) respectively. The major conclusions of the study remain intact.

3.5 RESULTS

The following results are obtained by setting the lag length of all economies as eight quarters, the same as Bayoumi and Eichengreen (1994a), Whitt (1995), and Blanchard and Quah (1989). The only two exceptions are China and Germany; the former is of a twelve-month lag and the latter of a five-quarter lag. The impulse response functions of the last two countries explode if longer lags are taken. The sensitivity of the results with respect to lag length will be discussed later.

3.5.1 Impulse Responses Functions

Impulse response functions are shown in Figures 3.1 to 3.13; figures in the parenthesis denote the order of integration of the price and the lag length. The quarterly shocks of China are constructed by aggregating associated monthly shocks.

The long run impacts of the structural supply shock on price of China, Japan, and Germany are positive, in contrast to the predictions of the AD-AS model. The signs of Japan and Germany reverse if shorter lags are used, but that of China is very stable with respect to lag length. The non-complying outcome of China inevitably discounts any conclusions drawn from the study.

Bayoumi and Eichengreen (1994a) also find that some of the countries studied in their paper whose primary industries are relatively large – the same as China – show similar non-complying results for the price response to supply shocks. They suggest that for those countries supply disturbances are likely to be caused by changes in the terms of trade of their primary products. A favorable terms of trade shock will prompt the outputs of those countries due to higher export incentives. Additionally, the shocks have positive impacts on real incomes due to the lower domestic price of imported goods. The rise in real incomes will boost aggregate demand for non-tradable goods. The result is higher domestic price levels.

Figure 3.1: China in Quarterly (p~I(2), L~12M)

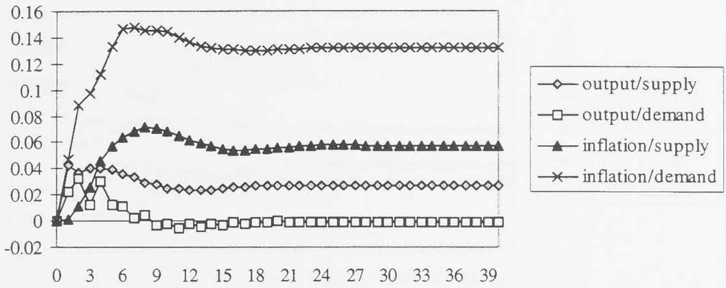


Figure 3.2: Hong Kong (p~I(1), L~8Q)

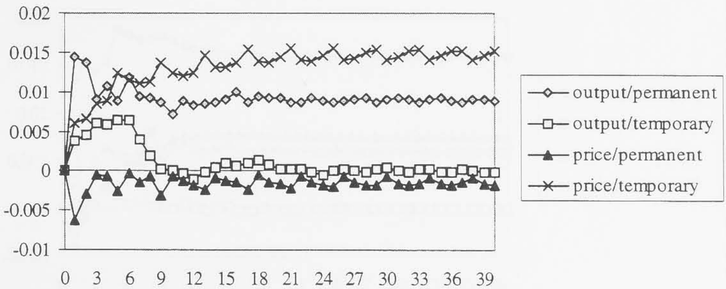


Figure 3.3: US (p~I(1), L~8Q)

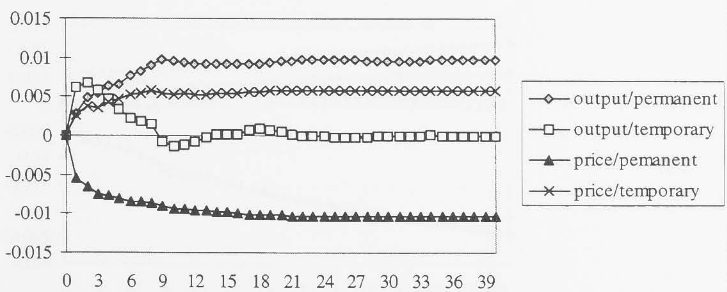


Figure 3.4: Japan (p~I(2), L~8Q)

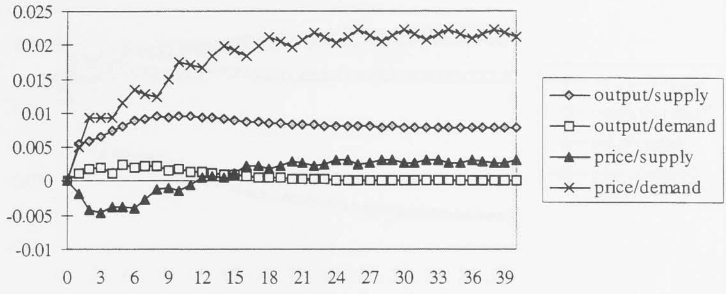


Figure 3.5: Germany (p~I(1), L~5Q)

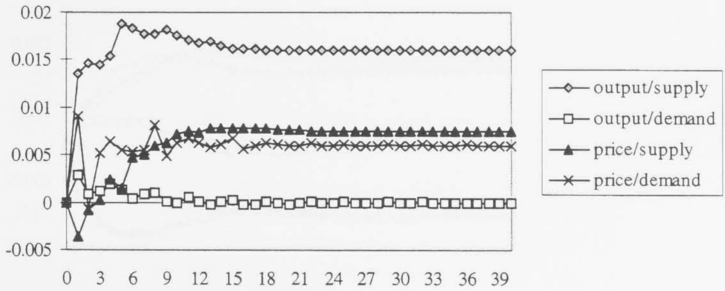


Figure 3.6: France (p~I(1), L~8Q)

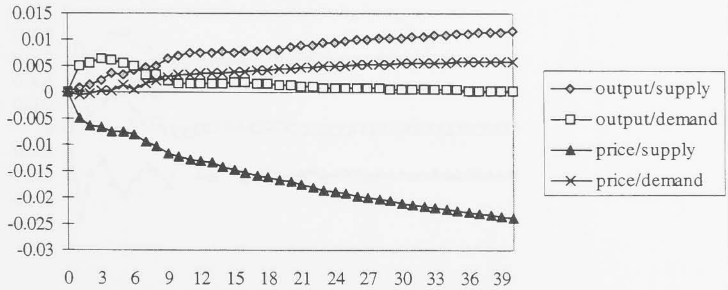


Figure 3.7: Italy (p~I(2), L~8)

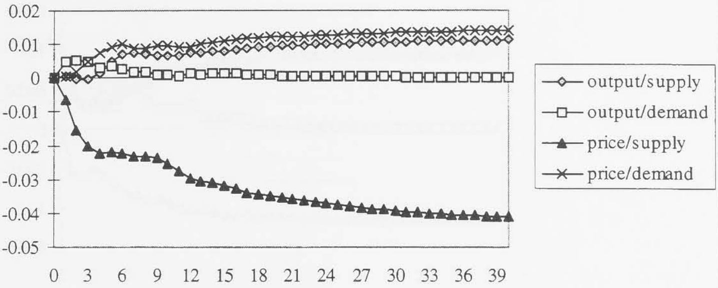


Figure 3.8: UK (p~I(1), L~8Q)

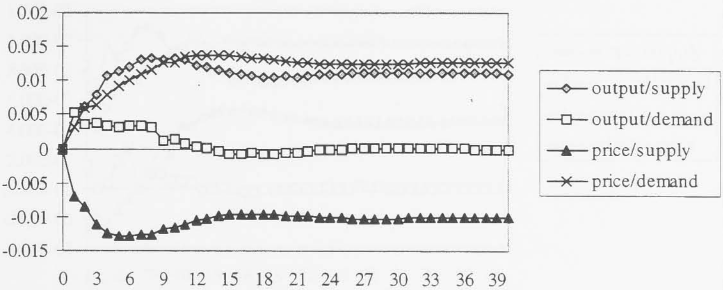


Figure 3.9: Austria (p~I(1), L~8Q)

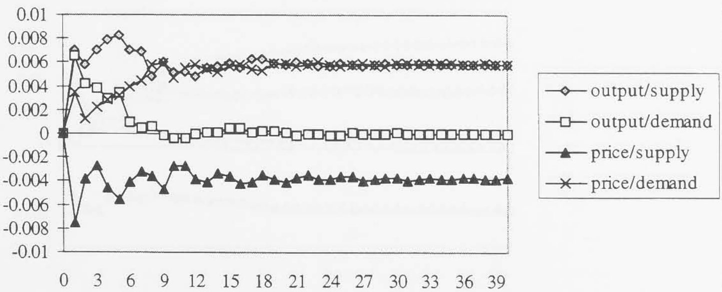


Figure 3.10: Netherlands (p~I(1), L~8Q)

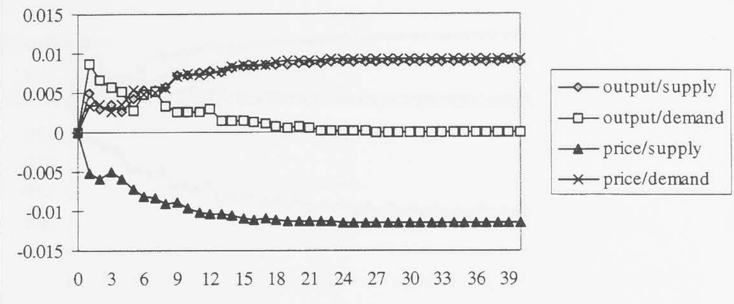


Figure 3.11: Switzerland (p~I(1), L~8Q)

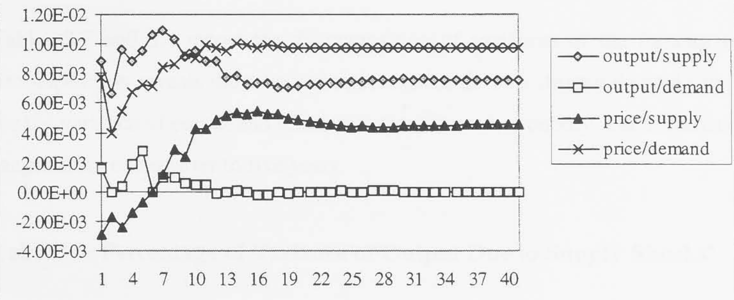


Figure 3.12: Spain (p~I(1), L~8Q)

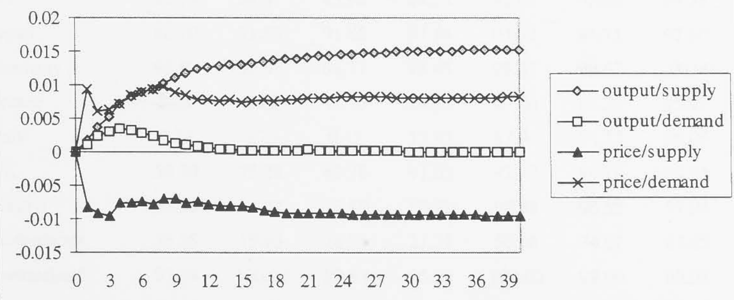
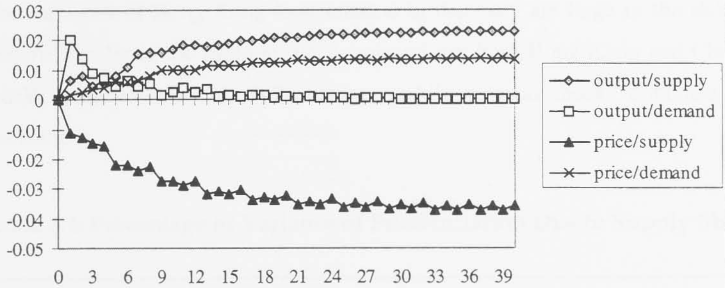


Figure 3.13: Greece (p~I(1), L~8Q)



3.5.2 Variance Decomposition

Tables 3.3 and 3.4 report the decomposition of variances of the forecast errors. The decomposition reveals the relative importance of the two structural shocks in accounting for the variance of output and price (inflation) in each economy. The forecasting horizon ranges from one quarter to five years.

Table 3.3: Percentage of Variance of Output Due to Supply Shocks[a]

No. of Quarters	1	2	3	4	6	8	12	20
China	24.30	61.03	83.19	64.33	90.75	95.99	99.95	99.92
Hong Kong	93.54	90.15	68.64	77.45	77.81	95.73	98.17	99.97
US	16.33	34.07	45.92	64.33	91.43	97.56	99.35	99.74
Japan	96.10	91.58	91.86	97.54	94.92	94.71	97.80	99.84
Germany	95.50	99.67	99.37	98.45	99.51	99.67	100.00	99.99
France	3.23	5.11	11.70	24.32	40.26	69.32	95.97	97.62
Italy	0.73	0.20	0.41	17.85	87.94	94.33	96.05	99.58
UK	50.70	75.28	80.78	91.03	92.77	94.74	99.95	99.76
Austria	53.56	65.72	77.80	87.32	97.88	98.52	99.98	99.98
Netherlands	25.26	15.93	26.36	21.21	56.56	74.07	87.85	99.41
Switzerland	97.04	100.00	99.83	95.58	100.00	99.06	99.98	99.99
Spain	68.11	69.63	74.72	81.55	90.44	97.06	99.75	99.95
Greece	9.82	25.01	18.45	44.57	73.36	89.00	97.83	99.71

(a) The percentages of variances due to Demand shocks are just equal to one hundred minus the corresponding figures in the table.

The percentages of supply shocks for outputs generally increase as the time horizon extends, because the long run neutrality restriction has been imposed on demand shocks. The variances of Hong Kong look unusual in that they are large in the short run but become smaller in the medium run. In general, for both Hong Kong and China supply shocks dominate the output fluctuations, while demand shocks dominate the price fluctuations.

Table 3.4: Percentage of Variance of Price/Inflation Due to Supply Shocks[a]

No. of Quarters	1	2	3	4	6	8	12	20
China	0.40	2.19	9.96	16.86	16.19	20.49	17.28	15.68
Hong Kong	52.37	17.07	0.24	0.55	0.04	0.32	2.26	1.23
US	80.69	75.75	81.39	75.66	72.67	69.23	76.04	75.63
Japan	11.93	16.38	19.61	14.75	7.92	1.04	0.09	2.07
Germany	13.39	61.17	0.21	12.97	7.04	35.03	57.93	62.88
France	98.91	99.93	99.84	99.89	99.48	95.71	93.19	93.37
Italy	99.47	98.35	94.14	90.30	83.63	87.55	90.84	89.16
UK	82.70	67.54	74.67	71.65	61.96	54.43	37.51	36.43
Austria	82.66	91.08	60.44	70.91	52.19	27.27	30.34	32.87
Netherlands	72.47	72.94	77.74	74.65	73.36	73.11	66.07	60.52
Switzerland	12.55	15.59	15.96	4.49	0.00	10.21	19.62	19.88
Spain	43.61	69.36	69.45	54.25	40.93	33.97	50.65	57.14
Greece	98.55	96.78	95.18	94.28	93.24	89.28	88.15	87.46

(a) The percentages of variances due to Demand shocks are just equal to one hundred minus the corresponding figures in the table.

3.5.3 Correlation of Supply shocks

Table 3.5 reports the correlations of supply shocks between all the countries. The correlations are measured across the period of 1986Q1-1993Q3, with 31 net observations in quarterly terms. The significance of the correlations (ρ) is tested by z-

Table 3.5: Correlation of Supply Shocks between CMU, E9, and G3

	China	HK	US	Japan	Germany	France	Italy	UK	Austria	Netherlands	Switzerland	Spain	Greece
China	1.00												
HK	-0.01	1.00											
US	-0.27	-0.03	1.00										
Japan	-0.18	0.24	-0.02	1.00									
Germany	-0.23	0.00	-0.12	0.16	1.00								
France	0.18	0.01	0.02	-0.11	0.02	1.00							
Italy	0.06	-0.04	0.22	0.12	-0.07	0.08	1.00						
UK	0.05	-0.06	0.02	-0.09	-0.31*	-0.09	-0.23	1.00					
Austria	-0.10	-0.17	0.17	0.29	0.17	0.00	-0.02	-0.15	1.00				
Netherlands	0.23	0.02	-0.21	-0.09	-0.24	0.15	-0.07	-0.23	-0.31*	1.00			
Switzerland	-0.12	-0.12	0.28	0.20	-0.12	0.09	0.15	0.21	0.23	0.10	1.00		
Spain	-0.12	0.18	-0.05	***0.39***	0.23	0.30*	0.30*	0.02	0.07	0.19	***0.41***	1.00	
Greece	-0.03	0.07	0.18	-0.08	-0.01	0.27	0.33*	-0.04	-0.13	0.28	0.22	***0.39***	1.00

Highlighting, Italian bold, and asterisk (*) denote significance at 1, 5, and 10 percent levels respectively. With 31 observations, the corresponding critical values for two-tails tests are ± 0.46, ± 0.35, and ± 0.30 respectively.

tests, based on the assumption that the correlations are asymptotically normally distributed.[29]

The supply shocks between China and Hong Kong have a negative correlation, but are insignificant at even a 10 percent level. Both economies are not positively correlated to any other economies. In particular, Hong Kong is not significantly correlated to its pre-1997 sovereignty state, the UK. It is also not significantly correlated to the US, the country with whose currency it has pegged the Hong Kong dollar.

The correlations between the G3 are not significant at even a 10 percent level. It eliminates the possibility of strong international business cycles. Lastly, the estimation results are not in favor of forming any monetary union within the E9 group. Whitt (1995) applies the same method as in this chapter on several EC members across the period of 1965Q2-1992Q2. He finds that Germany is strongly correlated to France, Italy, and the Netherlands respectively, but not to the UK. Bayoumi and Eichengreen (1994a) use annual data across 1960-90, and find that Germany, France, the Netherlands, Austria, Switzerland, and Italy are strongly correlated. However, Spain and the UK are not correlated to them.

3.5.4 Correlation of Demand shocks

Table 3.6 reports the correlations of demand shocks. The correlation between China and Hong Kong is negative but, again, insignificant. Neither the correlation between Hong Kong and the UK, nor that between Hong Kong and the US, is significant. The insignificance of the correlation between Hong Kong and the US is rather unexpected. As the Hong Kong dollar is pegged to the US dollar, if monetary shocks dominate demand shocks for both economies, their demand shocks should be synchronized.

Again, the G3 economies are not correlated. Amongst the E9, Germany, France, Italy, Austria, Switzerland, and to a lesser extent the Netherlands, form a core. Whitt (1995)

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[29] That is, under the null hypothesis $\rho = 0$, $\rho \sim N(0,1/n)$, where n is the number of observations. At 5 percent significance level, the critical value is $1.96/n^{1/2}$.

Table 3.6: Correlation of Demand Shocks between CMU, E9 and G3

	China	HK	US	Japan	Germany	France	Italy	UK	Austria	Netherlands	Switzerland	Spain	Greece
China	1.00												
HK	-0.06	1.00											
US	0.07	0.17	1.00										
Japan	0.19	-0.15	-0.17	1.00									
Germany	0.05	-0.24	-0.05	0.22	1.00								
France	0.09	-0.29	-0.10	0.08	***0.50***	1.00							
Italy	-0.25	-0.12	***-0.37***	0.02	0.06	***0.39***	1.00						
UK	0.14	-0.02	-0.03	0.08	0.08	0.03	0.03	1.00					
Austria	-0.23	-0.22	-0.21	0.03	***0.44***	***0.44***	0.04	-0.17	1.00				
Netherlands	-0.17	-0.27	0.11	0.20	0.15	0.30*	0.11	-0.24	0.28	1.00			
Switzerland	0.09	-0.29	0.20	0.19	***0.35***	0.19	0.09	-0.05	0.12	0.12	1.00		
Spain	-0.24	0.13	0.11	0.01	0.28	0.20	0.11	-0.13	0.17	-0.02	0.23	1.00	
Greece	-0.10	-0.08	-0.27	-0.02	-0.20	0.12	0.05	-0.29	0.01	0.18	0.00	-0.23	1.00

Highlighting, Italian bold, and asterisk (*) denote significance at 1, 5, and 10 percent levels respectively. With 31 observations, the corresponding critical values for two-tails tests are ± 0.46, ± 0.35, and ± 0.30 respectively.

finds Germany is uncorrelated with Italy, but significantly negatively correlated with the Netherlands, France, and the UK. The findings of this study are closer to that of Bayoumi and Eichengreen (1994a), who discover that most European countries are strongly correlated in terms of demand shocks, except Germany and the UK.

A possible explanation for the discrepancies between the results of this chapter and the other two studies are the differences in data nature and time span. For example, Whitt (1995) uses monthly industrial output and producer prices, Bayoumi and Eichengreen (1994a) use annual GDP and the deflator, whereas this chapter uses quarterly GDP and the deflator. Secondly, the estimation time spans of the first two studies are similar, but longer than that of this study.

3.5.5 Lag Effects

Recall that a special feature of the CMU is that China and Hong Kong are of disparate economic structures on the one side, but deeply integrated on the other. The first factor will result in weak correlation of disturbances between the two economies, while the second one in a strong correlation. Previous findings indicate that both demand and supply shocks are insignificantly negatively correlated for the CMU. It seems to suggest that the first factor dominates the second one. However, the two factors may not act at the same phase. If the connection of business cycles between China and Hong Kong relies on transmission of disturbances from one to the other, there may be lag relationships between the disturbances they experience. Nonetheless, like Granger causality, the presence of any lag relationships is only necessary, but not sufficient, to prove the transmission mechanism.

Tables 3.7 and 3.8 report the results of testing this transmission hypothesis. It should be noticed that if the direction of transmission of disturbances is from China to Hong Kong, the shocks of Hong Kong will <u>lead</u> rather than lag that of China, and vice versa.[30]

[30] This is because the shock u_{t-1} actually comes a period ahead of u_t.

Table 3.7: Correlation of Supply Shocks with Transmission Lags

Number of leads of Hong Kong	China	US	Japan	UK
0	-0.01	-0.03	0.24	-0.06
1 (lead)	-0.18	0.16	0.18	0.03
2	***0.38***	-0.12	***0.47***	-0.11
3	0.17	-0.14	0.06	0.32*
4	0.16	0.16	-0.26	***0.42***
5	-0.11	0.14	-0.18	-0.09
6	0.25	0.24	-0.23	-0.07
7	0.13	-0.14	-0.24	-0.08
8	0.13	-0.01	-0.29	0.08
-1 (lag)	0.13	-0.01	-0.21	0.30*
-2	0.07	-0.07	0.13	0.07
-3	-0.26	0.28	0.16	0.08
-4	-0.17	0.04	-0.20	-0.06
-5	-0.02	0.25	-0.22	0.16
-6	-0.09	0.01	0.07	0.05
-7	0.15	-0.00	0.16	0.08
-8	-0.08	-0.10	0.06	0.017

Highlighting, Italian bold, and asterisk (*) denote significance at 1, 5, and 10 percent levels respectively. With 31 observations, the corresponding critical values for two-tails tests are ± 0.46, ± 0.35, and ± 0.30 respectively. The testing periods of 1 lag term is 1986Q2-1993Q4, of 2 lag terms is 1986Q3-1993Q4 etc.

For supply shocks, the correlation is significant at two leads (at 5 percent level) but not at other leads. For demand shocks, the picture is not that clear. The correlations at one lead and five lags are positively significant at 10 percent and 5 percent levels respectively, but that at six leads and two lags are negatively significant at a 10 percent level. Therefore, as far as supply shocks are concerned, the findings are consistent with the China-to-Hong Kong transmission hypothesis.

Once two leads are allowed, the correlation of supply shocks between Hong Kong and Japan becomes highly positively significant too. But that of demand shocks becomes negatively correlated. Again, Hong Kong and the US remain insignificantly correlated for supply shocks, but significantly negatively correlated for demand shocks. The supply shocks of Hong Kong and the UK are also significantly correlated with four leads.

Table 3.8: Correlation of Demand Shocks between Transmission Lags

Number of leads of Hong Kong	China	US	Japan	UK
0	-0.06	0.17	-0.15	-0.02
1 (lead)	0.21	-0.04	***-0.36***	0.05
2	0.33*	-0.03	0.19	-0.21
3	0.05	***-0.37***	0.06	0.08
4	-0.07	0.11	-0.05	-0.01
5	0.08	-0.21	0.27	-0.05
6	-0.33*	-0.00	-0.30*	-0.14
7	0.03	-0.30*	-0.03	0.20
8	-0.09	-0.27	-0.02	-.020
-1 (lag)	-0.28	-0.27	-0.08	0.24
-2	-0.30*	-0.03	-0.05	0.02
-3	0.06	0.21	-0.03	-0.09
-4	-0.19	0.05	0.33*	0.06
-5	***0.42***	0.05	-0.08	0.15
-6	0.04	0.11	-0.11	0.03
-7	-0.02	0.05	0.16	0.00
-8	-0.01	-0.19	0.13	0.08

Highlighting, Italian bold, and asterisk (*) denote significance at 1, 5, and 10 percent levels respectively. With 31 observations, the corresponding critical values for two-tails tests are ± 0.46, ± 0.35, and ± 0.30 respectively. The testing periods of 1 lag term is 1986Q2-1993Q4, of 2 lag terms is 1986Q3-1993Q4 etc.

Hence, overall, the findings are consistent with the hypothesis put forward earlier. That is, as China and Hong Kong are of very diverse economic structure, they are unlikely to be hit by the symmetric sector-specific shocks. Therefore, their business cycles are not synchronous. On the other side, via the extensive economic linkage between the two, disturbances can be transmitted easily from the big economy China to the small economy Hong Kong. Significant lag correlation of supply shocks but not of demand shocks indicates that the synergy between the two economies are more a result of structural complementarity than policy coordination. This is in contrast to the finding of Angeloni and Dedola (1999) in that monetary policy coordination is behind the increased macroeconomic convergence of EMU members.

3.5.6 Correlation with Chinese Provinces

So far, China is treated as a completely integrated economy. In fact, China is composed of thirty provinces, municipalities, and autonomous regions (all denoted as 'province' henceforth). These provinces are of very different endowment, levels of development and degrees of openness. The linkages between them and Hong Kong are far from uniform. Therefore, it is worthwhile to disaggregate China into provincial units and verify whether Hong Kong is more correlated to coastal provinces like Guangdong than inland provinces.

Tables 3.9 and 3.10 report the results of such an exercise. The testing period is 1990Q2-1995Q1, with 20 net observations in quarterly terms. Due to insufficiency of data, Tibet is omitted in the estimation, and Hainan is included in the Guangdong province. The orders of integration and the lag lengths of all the provinces are taken as those of China as a whole. That is, output is I(1), price is I(2), and the number of lag is 12 months.

Only three provinces (Heilongjiang, Hebei and Guangxi) are significantly negatively correlated to Hong Kong in terms of either structural shock. The results are consistent with the findings that Hong Kong is insignificantly correlated to China as a whole.

Again, the correlation is tested with transmission lag terms. When one or two leads are allowed, couples of provinces become significantly correlated to Hong Kong at 5 percent level in terms of supply shocks. They include Tianjin, Liaoning, Jilin, Zhejian, Jiangxi, and Guangdong. The correlations with Beijing, Jiangsu, Anhui, Fujian, Shandong, Guangxi, and Shaanxi are also significant at a 10 percent level. Most of them are the relatively more developed and open provinces around the coastal line (Figure 3.14). Also at the two-quarter lag, the correlations with three inland provinces, Inner Mongolia, Heilongjiang, and Hubei, become significantly negative.

In 1994, the positive group of provinces at a 5 percent level accounted for 32.6 percent of national industrial output; including the 10 percent provinces increases this share to 85.6 percent. In comparison, that of the negative group is only 14.4 percent. Therefore, this is consistent with the result at the national level that China and Hong Kong are significantly correlated when two leads are allowed.

Table 3.9: Correlation of Supply Shocks between Hong Kong and Chinese Provinces

	0	1 lead	2 leads	3 leads	1 lag	2 lags	3 lags
Beijing	0.25	0.18	0.39*	-0.31	-0.02	0.16	-0.03
Tianjin	-0.16	***0.45***	0.04	-0.03	-0.03	0.30	0.19
Hebei	0.07	0.32	-0.06	0.00	-0.08	-0.41	-0.13
Shanxi	0.02	0.17	-0.17	0.25	0.00	-0.09	-0.40*
In. Mongolia	-0.23	0.20	***-0.74***	0.08	0.16	-0.13	0.17
Liaoning	0.10	0.00	***0.49***	0.09	-0.20	0.31	-0.28
Jilin	0.15	-0.10	***0.42***	-0.31	-0.10	0.33	-0.09
Heilongjiang	-0.38*	0.03	***-0.54***	0.32	0.27	-0.10	0.08
Shanghai	-0.19	0.31	0.19	0.25	0.03	-0.24	0.13
Jiangsu	0.05	0.11	0.37*	0.14	-0.06	0.19	0.01
Zhejiang	-0.06	0.03	***0.49***	0.06	0.01	0.01	-0.03
Anhui	0.22	-0.34	0.40*	-0.26	0.05	0.26	0.00
Fujian	0.17	0.01	0.41*	-0.23	-0.04	0.17	0.14
Jiangxi	-0.26	0.04	***0.44***	-0.03	0.05	0.21	0.01
Shandong	0.19	-0.24	0.37*	-0.04	0.05	0.22	-0.16
Henan	-0.06	-0.15	0.07	0.13	0.10	0.05	-0.05
Hubei	0.01	0.00	***-0.49***	0.02	0.16	***-0.47***	0.13
Hunan	0.00	0.31	0.22	0.15	0.13	-0.09	-0.08
Guangdong	0.13	-0.05	***0.46***	-0.18	-0.15	0.20	-0.12
Guangxi	-0.19	0.34	0.39*	0.29	-0.06	0.16	-0.02
Sichuan	-0.12	0.06	0.02	0.28	0.27	-0.04	-0.11
Guizhou	0.11	-0.01	0.28	0.07	-0.02	-0.13	-0.32
Yunnan	0.28	0.05	0.35	-0.23	-0.09	0.10	-0.38*
Shaanxi	0.25	-0.01	0.40*	-0.07	0.07	0.05	0.05
Gansu	-0.10	0.10	0.35	0.19	-0.10	0.31	-0.10
Qinghai	-0.20	0.07	-0.04	-0.05	0.15	0.06	0.30
Ningxia	0.27	-0.01	0.27	0.25	0.25	-0.09	-0.34
Xinjiang	0.26	-0.02	0.16	-0.07	0.13	-0.21	-0.35

Underline, highlighting, Italian bold, and asterisk (*) denotes significant at 0.1, 1, 5 and 10 percent level respectively. With 20 observations, the corresponding critical values of two-tails tests are ± 0.58, ± 0.44, and 0.37 respectively. Testing periods for zero lag is 1990Q2-1995Q1, for 1 lag is 1990Q3-1995Q2 etc.

Table 3.10: Correlation of Demand Shocks between Hong Kong and Chinese Provinces

	0	1 lead	2 leads	3 leads	1 lag	2 lags	3 lags
Beijing	-0.12	0.07	0.24	0.11	-0.10	-0.22	-0.21
Tianjin	-0.06	0.17	-0.37*	-0.19	0.22	0.15	-0.07
Hebei	***-0.45***	-0.27	-0.41*	-0.11	0.11	***0.44***	0.27
Shanxi	-0.03	-0.07	***-0.52***	0.08	-0.02	-0.28	-0.06
In. Mongolia	0.14	0.11	-0.09	-0.06	-0.19	-0.30	-0.37*
Liaoning	0.13	0.35	-0.15	-0.17	-0.08	***-0.57***	-0.42*
Jilin	0.19	-0.15	-0.11	0.12	0.10	-0.07	-0.18
Heilongjiang	-0.33	0.24	0.06	0.17	-0.40*	0.20	0.28
Shanghai	-0.10	0.22	-0.40*	-0.26	-0.07	-0.15	-0.15
Jiangsu	0.12	-0.05	-0.05	0.07	0.16	-0.16	-0.19
Zhejiang	0.05	0.31	0.03	-0.01	-0.23	***-0.54***	-0.24
Anhui	0.31	0.27	0.16	-0.40*	-0.22	-0.30	0.13
Fujian	-0.03	0.25	0.06	-0.03	-0.11	-0.41*	-0.01
Jiangxi	0.30	-0.22	-0.20	0.06	-0.12	-0.11	0.10
Shandong	0.19	0.28	-0.04	0.07	-0.07	***-0.53***	-0.28
Henan	0.09	-0.02	-0.15	-0.27	-0.24	-0.24	0.15
Hubei	-0.13	-0.02	-0.28	-0.21	-0.10	-0.10	0.02
Hunan	0.00	0.03	0.18	0.12	-0.14	-0.32	-0.16
Guangdong	-0.12	-0.16	0.07	0.06	0.12	0.05	-0.30
Guangxi	-0.37*	-0.37*	0.20	0.23	-0.04	-0.01	-0.19
Sichuan	0.27	0.14	-0.23	-0.24	-0.12	-0.31	0.11
Guizhou	-0.30	0.15	-0.29	-0.20	-0.14	-0.07	***0.55***
Yunnan	0.20	-0.11	0.31	0.20	-0.01	0.02	-0.19
Shaanxi	0.14	0.20	-0.27	-0.29	0.03	-0.14	0.16
Gansu	0.05	-0.12	-0.19	0.25	0.07	-0.05	-0.31
Qinghai	0.09	0.04	-0.35	-0.28	-0.10	0.02	0.26
Ningxia	0.17	-0.13	-0.23	-0.11	0.12	-0.26	-0.16
Xinjiang	-0.07	0.16	-0.18	-0.42	-0.16	-0.10	0.31

Underline, highlighting, Italian bold, and asterisk (*) denotes significant at 0.1, 1, 5 and 10 percent level respectively. With 20 observations, the corresponding critical values of two-tails tests are ± 0.58, ± 0.44, and 0.37 respectively. Testing periods for zero lag is 1990Q2-1995Q1, for 1 lag is 1990Q3-1995Q2 etc.

Figure 3.14: Provinces Correlated to Hong Kong in Supply Shocks

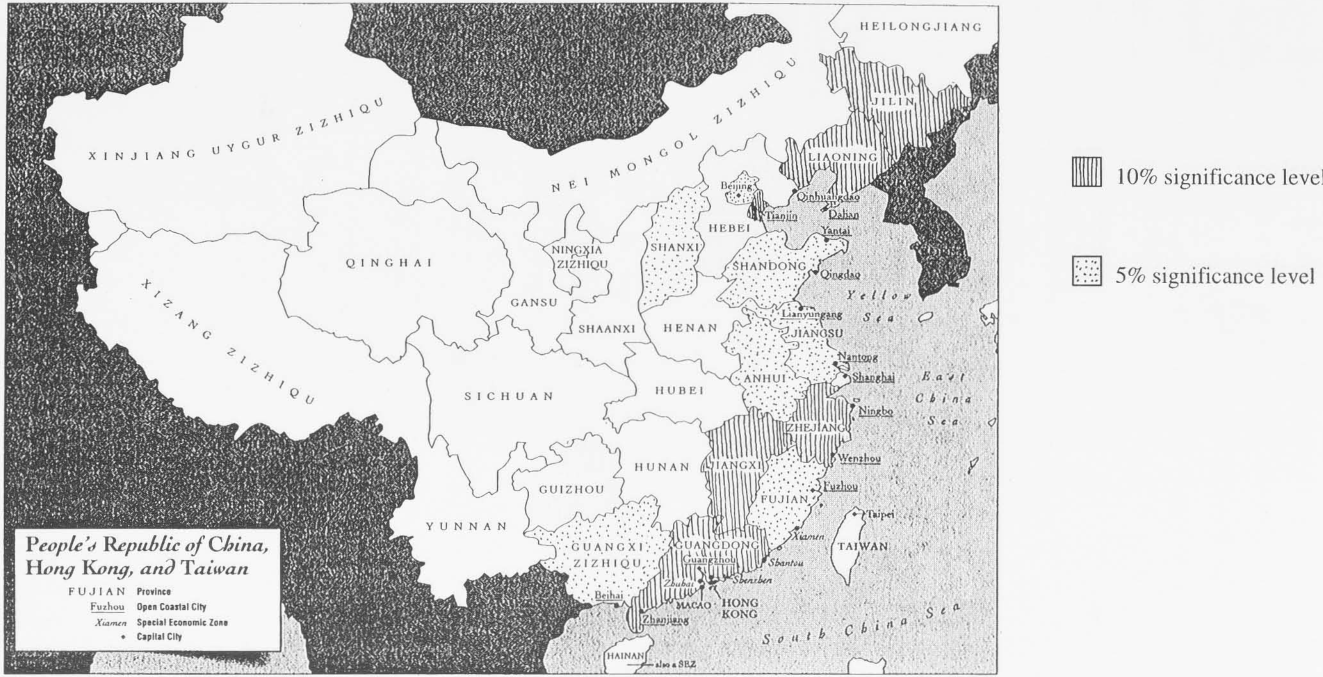

Figure 3.15: Provinces Correlated to Hong Kong in Demand Shocks

In terms of demand shocks, Hong Kong is only significantly positively correlated to Hebei with two lags and Guizhou with three lags at a 5 percent level (Figure 3.15). But it is contemporaneously negatively correlated to Hebei. Hong Kong is also negatively correlated to a number of other provinces with various lags and leads; but no shape pattern emerges.

3.5.7 Sensitivity Tests

It is not uncommon that the scaling of business cycles is sensitive to the number of lags (Hafer and Sheehan 1991). To ensure the robustness of the results, their sensitivity with respect to the lag length is examined. The estimations are repeated by selecting the lags for individual countries and provinces according to the Akaike's information criterion (AIC) except Japan, for which two lags are imposed.[31]

It turns out that, surprisingly, for most countries the AIC suggests only one lag, except for China, the US, Greece, and Japan. Compared to the previous case, this can be considered as an extreme test case. Some major findings concerning the CMU remain intact. In particular, for both demand and supply shocks, Hong Kong is not correlated to China, the UK or the US. Again, when two leads are allowed, the correlation of supply shock between China and Hong Kong becomes significant at a 5 percent level. On the other side, the correlations of supply shocks among the E9 have greatly increased, whereas those of demand shocks decreased. In contrast to the previous case, Hong Kong is not particularly correlated to coastal provinces even if lags or leads are allowed.

Lastly, uniformly four lags has been tested for all economies except Japan. The results are similar to those of AIC lags. The sensitivity has also been tested with respect to different degrees of integration of the prices of the E9 countries with AIC lags. The conclusions reached in sections 3.5.1-3.5.6 are also roughly intact.

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[31] For the case of Japan, a shorter lag length is used because the four lags suggested by AIC leads to 'abnormally' volatile fluctuations in the impulse response functions.

3.6 CONCLUSIONS

Drawing conclusions about the relative sustainability of the CMU and its European counterpart is not an easy task, given that this kind of decomposition exercise is quite sensitive to the many steps involved. Factors that can affect the results range from the source and period of data, decomposition technique, and degree of cointegration, to the number of lags. Therefore, it would be more comprehensive to take the results of other related studies into account, especially Dodsworth and Mihaljek (1997), Husain (1997), Chan (1996), Whitt (1995) and Bayoumi and Eichengreen (1994a).

For both supply and demand shocks, if no lag term is allowed, Hong Kong and China are far from being correlated. In general, certain EMU members are more correlated than Hong Kong and China in terms of business cycles, though the exact combination of the EMU core varies between studies. Hong Kong is correlated neither to the US nor to the UK. This is in contrast to the conclusion of Chan (1996) in that the business cycles of Hong Kong are more synchronous with those of the US than with China or the UK.

However, once a transmission lag term is allowed, the magnitude of the correlation of supply shocks in the CMU becomes quite comparable to that in the EMU. The finding shows support for the hypothesis that disturbances from the big economy China are transmitted to the small economy Hong Kong. The result indicates that the transmission takes about two quarters to work through.

The difference in demand and supply correlations hints that the synergy between the Chinese and Hong Kong economies are based more on their structural complementarity than on policy coordination. The findings are compatible with those of Husain (1997) and Dodsworth and Mihaljek (1997). Again, the findings are merely consistent with the above hypotheses, but far from being a rigorous proof.

In addition, disasggregating China into 30 provinces shows that Hong Kong is not uniformly correlated to all the provinces. The relatively more developed provinces around the coastal line have stronger correlation with Hong Kong than their inland counterparts. The result is fairly sensible, albeit not insensitive to the lag length.

Overall, there is still lack of strong evidence that the CMU is a vital idea at this stage.

Even though the business cycles of Hong Kong and China can be synchronized via some transmission channels, a significant time lag is involved. If a statement must be drawn on the relative sustainability between the EMU and the CMU, the conclusion will probably be in less favor of the latter, although many studies show that the EMU itself is also vulnerable to intra-union economic stress.

The findings also suggest that Hong Kong and the US do not constitute an OCA. Nevertheless, what supports the choice of the US dollar as the nominal anchor for Hong Kong and other economies like Argentina is its stability and acceptability in the international money market. This credibility factor, in fact, is the primary reason why a fixed exchange rate regime is needed for those economies. In this regard, the renminbi, which is yet a fully convertible currency, can hardly make a case comparable to the US dollar in the foreseeable future.

Lastly, it is necessary to restate one of the caveats of the findings. That is, all measurements are essentially *ex ante*; potential endogenous changes in business cycle linkages are ignored. In particular, a number of European countries have harmonized their monetary policies through the ERM for quite some time (at least before the unification of Germany), and countries like Austria have a long history of pegging its currency with the Deutschmark. This kind of distinction in the institutional arrangements may cause differences in the symmetry of disturbances between the EMU and the CMU members.

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Appendix 3

Data Source

Data for all the OECD countries except Japan obtained from the International Economic Data Bank (IEDB), Australian National University (ANU). The primary sources are International Financial Statistics published by the IMF. Data of Japan are obtained from the Nikkei Data Bank, Australia-Japan Research Center, ANU. National Data of China are obtained from its central bank, the People's Bank of China (PBC); provincial data are obtained from Chinese Monthly Statistics, various issues. Data of Hong Kong are provided by the Hong Kong Monetary Authority. The sample periods for all the countries are listed in Table 3.A1.

Table 3.A1: Sample Periods of Tested Countries

Country	Period	Country	Period
China	1985M1-1996M8	Netherlands	1977Q1-1996Q2
Hong Kong	1984Q1-1996Q1	Switzerland	1973Q1-1996Q2
US	1973Q1-1996Q3	UK	1973Q1-1996Q3
Japan	1973Q1-1996Q3	Austria	1973Q1-1995Q4
Germany	1979Q1-1996Q3	Spain	1973Q1-1996Q2
France	1973Q1-1996Q2	Greece	1973Q1-1996Q2
Italy	1973Q1-1993Q3		

All the data are in quarterly terms. The only exception is China; those data are in monthly terms. The monthly structural shocks of China are measured, and then aggregated into quarterly shocks to compare with those of other countries. This is because the time span of the Chinese data is only about ten years. If the monthly data are aggregated into quarterly data, there will only be about 40 observations, which are not quite enough for estimations.

It should be noted that although the correlations of the structural shocks between various countries are measured across the same period, the structural VARs of various countries are estimated across different time spans. This is because the data of China are from

1985Q1 onward, but that of Italy are before 1993Q3. If the sample periods of all the countries are required to be the same, the usable observations will be too few for estimations. Therefore, the VARs of the countries are estimated across different data sample periods. Once the structural shocks are obtained, their correlations can be calculated across a common period. All countries' data are already deseasonalized, except those of China, Hong Kong, and Greece. The data of these three countries are deseasonalized by being regressed against seasonal dummies.

The estimation period of Hong Kong starts from 1984Q1 to avoid a structural break at the end of 1983. Hong Kong changed its exchange rate regime in October 1983 from free floating to pegging with the US dollar.[32] Likewise, since 1992, there have been some disturbances in the ERM. Italy and UK were forced to depart from the ERM and realigned their NERs in September 1992.[33] In July 1993, the exchange rate band of the ERM was widened from plus or minus 0.25 percent to 4 percent, to 5 percent. The Germany unification in 1990 might cause a structural break in the data of Germany. These potential structural breaks for the E9 are not tested (and allowed) since it would shorten the time span for comparison.

Chinese Data

Some problems about the use of Chinese data must be stressed. First of all, the official monthly price index is reported on a year-on-year basis, so they can not be used directly to measure monthly inflation. The following example is used to illustrate this point. Suppose Table 3.A1 records the official statistics of years 2 to 4.

According to Chinese official statistics, the price index of January of year 3 (112) is measured relative to that of year 2 (101). Therefore, the inflation rate between January and February of year 3 should not be calculated as $\Delta p/p = (107-112)/112$.

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32 Kwan and Lui (1996) confirm that there is a structural break of data around the end of 1983.

33 Actually the history of UK's participation in the ERM is very short compared to the time span of its data. So in principle, there may be two structural breaks, one corresponds to its participation and the other to its departure.

Table 3.A2: Official Statistics

Month	Year 2	Year 3	Year 4
Jan	101	112	105
Feb	106	107	111
March	108	102	104
etc.	...	...	...

If somehow a complete monthly data set of a particular year, said year 1, is available, then the inflation rate can be calculated for all other years on a monthly basis. However, no such starting point data set can be obtained. To get around this problem, an annual inflation rate of a particular year is used to construct a series of monthly price index by assuming a constant compound monthly rate such that the annual rate just matches the reported data of that year.

Suppose the reconstruction of the price index starts at year 1. Data of annual inflation rates of any years are available for China. Suppose that of year 1 is 110 per cent. The price index of January of year 1 is normalized to 100. Assuming that monthly inflation of year 1 is constant and equals to π, then π is given by $100*(1+\pi)^{11} = 110$, or $\pi = 0.0087$.

The reconstructed price indexes of the following years are shown in Table 3.A3. Now, the inflation between January and February of year 3 can be calculated as usual. That is $\Delta p/p = (114.40-113.12)/113.12$.

However, since the monthly data of year 1 are obtained by construction, some errors could be borne in the reconstructed data set. Firstly, some data are missed in the official reports. Those blank figures are 'guessed' by referring to figures of neighboring provinces. Secondly, the credibility of Chinese official data is always a disputable issue. Chen and Hou (1986), and Feltenstein and Ha (1991) find that Chinese official figures understate the inflation rate. And mass media continues to report that the Chinese authorities tend to use administrative means to manipulate inflation index figures (Hong Kong Standard 1996).

Table 3.A3: Reconstructed Statistics

Month	Year 1	Year 2	Year 3	Year 4
January	100	101 = 100*1.01	113.12 = 101*1.12	118.78 = 113.12*1.05
February	100.87 = 100*(1.0087)	106.92 = 100.87*1.06	114.40 = 106.92*1.07	126.98 = 114.40*1.11
March	101.75 = $100*(1.0087)^2$	109.89 = 101.75*1.08	112.09 = 109.89*1.02	116.57 = 112.09*1.04
etc.	...	...	...	...
December	110 $=100*(1.0087)^{11}$	...	...	...

Any error in the guessed figures or falsification in the reported data would be multiplied by the reconstruction process. This is because a reconstructed figure is based on all its previous figures; any distortion of the original figure of a particular month in a particular year will be transmitted to the reconstructed figures of the same month of all succeeding years.

To illustrate this problem, reconsider the same set of data in Table 3.A2. Suppose the authorities falsely published a lower figure in the February of year 2 (104 instead of 106). Now Table 3.A2 would look like Table 3.A4.

Table 3.A4: Official Statistics (with error)

Month	Year 2	Year 3	Year 4
Jan	101	112	105
Feb	104 (error)	107	111
March	108	102	104

Taking the same process of reconstruction as previously, Table 3.A3 now becomes Table 3.A5.

Table 3.A5: Reconstructed Statistics (with error)

Month	Year 1	Year 2	Year 3	Year 4
January	100	101	113.12	118.78
February	100.87	104.90 = 100.87*1.04	112.25 = 104.90*1.07	124.60 = 112.25*1.11
March	101.75	109.89	112.09	116.57

Although there is 'only' one error in the original data set, the error will ripple to all the following years through the reconstruction process. The consequences are that it will affect the calculation of monthly inflation rates between January and February, and February and March of year 2 and all successive years.

Chapter 4

Chinese Monetary Union

Part II

Synopsis 4

This chapter examines the prospect of using uniform monetary policies to manage the macroeconomic activities of the heterogeneous Chinese provinces in the light of the optimum currency area (OCA) literature. It is found that a single market has not yet formed in China, largely attributed to local protectionism. In terms of symmetry of disturbances, Chinese provinces are not as correlated as their European and American counterparts. Only a group of eastern provinces are consistently strongly correlated. The result suggests that treating China as an integrated economy might be misleading not only at the micro level, but also at the macro level, especially in understanding its business cycles. The finding also casts doubts on the effectiveness of using uniform monetary policies to manage the business cycles of all the provinces.

4.1 INTRODUCTION

Since China started its 'long march' of economic reform in the late 1970s, its fast growth has been characterized by a volatile swing of macroeconomic cycles (Khor 1992; Tseng, Khor et al. 1994). A fundamental cause of these abrupt business cycles is over administrative decentralization and under economic decentralization (Blejer et al. 1991). Economic reform has only partly removed economic power from the hands of the central government to the market, and, perhaps, more into the hands of local authorities. The pre-reform larger-sized national command economy has been transformed into a number of smaller-sized local command economies (Jia and Wang 1994). Without sufficient coordination, especially in the presence of inter-regional competition, local policies were distant from being consistent with national macroeconomic objectives.

In the journey of building a "socialist market economy" in which the market will be a primary mechanism for resource allocation, there are two key aspects in maintaining macroeconomic stability. As pointed out by Breslin (1995), the central authorities should regain the control of macro management instruments from the hands of local government. Secondly, as recommended by the International Monetary Fund (IMF), command type controls should give way to other instruments that are more compatible with market mechanisms, such as monetary, fiscal, and exchange rate policies (Blejer, Burton et al. 1991).

In macroeconomic management, monetary policy has a vital role. In the pre-reform era, the functions of money were largely suppressed, perhaps except as a unit of accounting. Money was "essentially a monitoring device exercised by the central authority on the performance of different micro units in fulfilling their assigned obligations or quotas" (Li 1995:4). In the reform period, money has been reestablishing its role as a medium of exchange and a means of saving. Li (1995) estimates the causal relationships between currency in circulation, inflation, interest rate and investment for both the pre-reform (1952-79) and reform (1980-91) periods. He concludes that the use of money increased in the reform period, but the causal relationships between money supply and the other three variables were still weak. Using slightly more recent data from 1985 to 1993, Tseng, Khor et al. (1994) find that broad money and net domestic assets are significant variables in explaining both industrial production and inflation. The results seem to signal the rapid progression of monetization of the Chinese economy.

Even if the economy is increasingly monetized, ironing out business cycles with monetary instruments might not be an easy task for the central authorities, given that China is a structurally diverse economy. China is of stretched size and huge population. In terms of administration, it consists of 30 provinces, municipalities, and autonomous regions (hereafter all denoted as "provinces" unless specified otherwise). Different provinces have vastly different levels of development and openness, not to mention the gap between rural and urban areas within each province. Trade barriers between provinces are also considered high.

Questioning the prospect of using one set of monetary instruments to manage the macroeconomic activities of numerous Chinese provinces is essentially the same as asking whether China constitutes an optimum currency area (OCA).

As stated in the last chapter, in the OCA paradigm there are three fundamental elements: flexibility of prices and wages, symmetry of disturbances, and similarity of policy objectives. Primarily all the OCA criteria are about how to mitigate the impacts of asymmetric disturbances between member states, when prices and wages are too sluggish to adjust in the short run. The more dissimilar the economic structures of the member states, the more likely they will be hit by asymmetric shocks. Further, if other compensating factors, such as labor mobility, do not work effectively to equalize the impacts of idiosyncratic shocks, uniform monetary policies across the nation might not be sufficient to manage the business cycles of all provinces. Provincial fiscal authorities will be forced to take a greater role in macroeconomic management. Then it will inevitably touch a politically sensitive issue – fiscal transfers between affluent and less prosperous regions.

On the other side, a key shortcoming of most OCA applications is that they fail to take account of the dynamic impacts of monetary unification. As advocators of the EMU have claimed, zero exchange risk and foreign exchange transaction costs are likely to stimulate intra-union trade and investment (CEC 1990). Stronger economic interdependence will lead to more effective transmission of disturbances between the member states (Frankel and Rose 1996).

In this study this pitfall of OCA theories can be turned into an advantage. The People's Republic of China (PRC) has adopted a single currency since it was established in 1949. Although money's functions were largely suppressed in the pre-reform period, it did not preclude the provincial economies from the potential benefits of zero exchange rate risk and zero currency exchange cost. After 50 years, all benefits of monetary unification should be largely materialized, *in respect to the given institutional arrangements.* Therefore, if China is yet found to fulfill the OCA criteria, it means that either the provincial economies are structurally too dissimilar to be in the same currency area, or there are institutional settings hindering them from fully realizing the benefits of monetary unification.

Following this logic, the next section compares China with two other monetary unions in terms of a number of OCA criteria. The criteria include openness, fiscal integration, factors and commodities mobility, and similarity of economic structure. Section 3 estimates the symmetry of disturbances experienced by the provinces, and the last section concludes.

4.2 ECONOMIC FRAGMENTATION

At the outset, the prospect that China constitutes an OCA is undermined by the widespread phenomenon of economic fragmentation amongst the provinces. Economic fragmentation was nurtured before the reform by progressive decentralization of the economy. What first set the ground for this was Mao Zedong's self-sufficient (*zili gengsheng*) policy, under which the provinces were required to be economically independent (Zhao 1994). Later, in the late 1970s, after almost three decades of political movements, the central authority urgently needed remedies to cure the damaged economy. To mobilize local enthusiasm in production, the central government decided to conduct the "*fenquan rangli*" policy. The principle was to decentralize administrative power and to allow local authorities and enterprises to retain part of their revenues.

It is commonly recognized that decentralization has been one of the engines behind the fast growth of the Chinese economy over the past two decades. However, this growth has not come without costs. Cannon and Zhang (1996) observe that local protectionism became stronger and more common in the reform era. The decentralized power of economic decision-making has not passed fully to enterprises (ibid.). Local authorities have as much, or even more, control and self-interest over those enterprises. Local governments are reluctant to invest in other regions to avoid losing revenues. To protect local enterprises, import embargoes of substitutes, and export embargoes of production materials, are not uncommon (Goodman 1994). Neither capital nor commodities is/are completely free to move across provincial borders. To a certain extent, the provinces have evolved into *aristocratic* or *cellular* economies (Jia and Wang 1994).

To obtain a more scientific assessment about the degree of economic fragmentation in China, the extent to which China satisfies several major OCA criteria has been examined. Two unions – the US and the European Community (EC) – are used as a benchmark for comparison.[1] The results for inter-union comparison are reported in Table 4.1 and those for inter-province comparison in Table 4.2.

It should be warned at the start that the figures for the US and EC are cited from other publications, so there may be discrepancies in the method of compilation. For example, in the case of labor mobility, the figures for the US and EC are measured by the percentage of total population that moved across regions within the unions. While that of China is measured by the percentage of total labor in the state-owned, collective-owned, and other ownership units that move across provinces.

Furthermore, the Chinese figures are based on official statistics. The credibility of Chinese statistics is always subject to scrutiny, as there have been reports about the authorities manipulating statistical figures. Nevertheless, as long as any errors in the provincial data are systemic and comparable, they will tend to cancel each other in the measurements of provincial differences.

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[1] The EC comprises 12 countries: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the UK.

Table 4.1: Comparison of OCA Criteria between China, the US, and the EC

Items	China	US	EC
Number of Member Economies	*30 Provinces*	*50 States*	*12 Countries*
Year [a]	*1994 (1987)*	*1986-1988*	*1986-1988*
Demand GDP per captia (US$) [b]			
Mean	497 (316)	16 936	10 752
Standard Deviation (STD)/Mean	0.67 (0.70)	0.22	0.38
Fiscal transfer from the central to locals as % of local expenditures [c]	36.07	20.9	...
Openness [d]			
Mean	0.32	14.7	18.5
STD/Mean	1.09	...	...
Mobility as % of workforce [e]	0.17	2.7	0.81-1.35
Relative size of primary industry (%) [f]			
Mean	22.9 (36.0)	4.1	7.4
STD/Mean	0.40 (0.39)	0.71	0.51
Relative size of secondary industry (%) [g]			
Mean	44.0 (49.6)	51.7	35.2
STD/Mean	0.20 (0.26)		
Relative size of tertiary industry (%) [h]			
Mean	33.1 (14.4)	44.2	56.2
STD/Mean	0.14 (0.21)	0.07	0.18

Sources of US and EC figures: Eichengreen (1990); sources of China data: Chinese Statistical Yearbook 1989 and 1996, and China Labour Statistical Yearbook 1995.

(a) Figures of the US and EC of different items are for different years. See the original source for more details. Data on relative size of the primary industry of EC members are for 1980 and 1983.

(b) Figures in parentheses are for 1987 for comparison.

(c) Figure for the US is for 1987, and that for Chinese is for 1995. Figures of Chinese provinces are calculated by the difference between locally collected revenue minus local expenditures, and are national values instead of provincial mean.

(d) Openness is measured by the total external trade, which is equal to export plus import, as a percentage of GDP.

(e) Labor mobility of the US in Ehrengerg's article is measured by total population that moved across regions in 1987. Figures of the EC is calculate according to an estimation that labor mobility in the US was about two to three times that in the EC (OECD 1986).

(f) The primary industry comprises agriculture sectors.

(g) Sizes of the secondary industry of the US and EC are calculated by 100 minuses the percentages of primary and tertiary industries. The secondary industry of China comprises mining, manufacture, water, energy, and construction. Sizes of industries of the US and EC are measured by shares of labor force, while those of China are measured by shares of industrial output in GDP.

(h) The tertiary industries of the US and EC comprise service sectors, and that of China comprises transportation, postal and telecommunication services, and commerce.

Table 4.2: Ordering of Provinces According to OCA Criteria

Order of Provinces						
Per Captia Demand GDP *(Descending)*	**Primary Industry** [a] *(Descending)*	**Secondary Industry** *(Descending)*	**Tertiary Industry** *(Descending)*	**Labor Transfer / Employment** *(Descending)*	**External Trade/GDP** *(Descending)*	**Transfer/ Expenditure** *(Ascending)*
Shanghai	Tibet	Shanghai	Beijing	Hainan	Guangdong	Shanghai
Beijing	Guizhou	Tianjin	Hainan	Qinghai	Beijing	Beijing
Tianjin	Jiangxi	Jiangsu	Shanghai	Beijing	Shanghai	Guangdong
Guangdong	Hainan	Heilongjiang	Tianjin	Guangdong	Tianjin	Jiangsu
Zhejiang	Hunan	Zhejiang	Tibet	Ningxia	Fujian	Tianjin
Liaoning	In. Mongolia	Shanxi	Shaanxi	Xinjiang	Hainan	Liaoning
Jiangsu	Guangxi	Liaoning	Ningxia	Hebei	Liaoning	Zhejiang
Fujian	Sichuan	Guangdong	Liaoning	Gansu	Zhejiang	Fujian
Hainan	Xinjiang	Anhui	Qinghai	Guizhou	Jiangsu	Hainan
Shandong	Jilin	Shandong	Fujian	Jilin	Tibet	Shandong
Heilongjiang	Hubei	Henan	Shanxi	Shaanxi	Shandong	Shanxi
Xinjiang	Henan	Hebei	Guangdong	Jiangxi	Jilin	Hebei
Jilin	Yunnan	Beijing	Gansu	Guangxi	Heilongjiang	Hubei
Hebei	Gansu	Gansu	Xinjiang	Tianjin	Guangxi	Hunan
Hubei	Qinghai	Yunnan	Guangxi	In. Mongolia	Shanxi	Anhui
In. Mongolia	Anhui	Fujian	Hunan	Heilongjiang	Shaanxi	Sichuan
Qinghai	Ningxia	Hubei	Yunnan	Hunan	Yunnan	Henan
Shanxi	Shaanxi	Jilin	Zhejiang	Shanghai	Xinjiang	Heilongjiang
Guangxi	Fujian	Qinghai	Hebei	Jiangsu	In. Mongolia	Jiangxi
Hunan	Hebei	Sichuan	Jiangxi	Hubei	Hebei	Guangxi
Ningxia	Shandong	Ningxia	In. Mongolia	Shandong	Hubei	Jilin
Anhui	Heilongjiang	Shaanxi	Shandong	Yunnan	Ningxia	Shaanxi
Sichuan	Zhejiang	Xinjiang	Hubei	Fujian	Gansu	Guizhou
Yunnan	Jiangsu	Guangxi	Jilin	Anhui	Jiangxi	In. Mongolia
Henan	Guangdong	In. Mongolia	Sichuan	Zhejiang	Guizhou	Yunnan
Jiangxi	Shanxi	Guizhou	Jiangsu	Shanxi	Sichuan	Gansu
Shaanxi	Liaoning	Hunan	Heilongjiang	Tibet	Anhui	Xinjiang
Tibet	Beijing	Jiangxi	Anhui	Henan	Hunan	Ningxia
Gansu	Tianjin	Hainan	Henan	Sichuan	Qinghai	Qinghai
Guizhou	Shanghai	Tibet	Guizhou	Liaoning	Henan	Tibet

(a) The second to forth columns refer to the measurements of industrial output to GDP ratio.

Finally, how to draw the boundary of 'indivisible' sub-union units is crucial. For instance, dividing China into 12 regions (i.e. the number of the EC countries) could give very different results from dividing it into 30 provinces. Fiscal autonomy or integration is commonly regarded as an appropriate criterion in defining the domains of sub-union units. The way the data are collected also poses a practical constraint on how to draw the domains.

4.2.1 Income Gap & Fiscal Integration

Measured in the standard deviation (normalized by the mean), the per capita GDP of China is more dispersed than those of the US and EC. In 1994, the three provinces with the highest per capita GDP were Shanghai (US$1764), Beijing (US$1191), and Tianjian (US$947), while the lowest three were Guizhou (US$180), Ganus (US$223), and Tibet (US$230). Nonetheless, comparing the figures of 1994 and 1987 shows that there is a slight convergence of per capita income across the provinces.

A large income gap between the provinces inevitably raises pressure to redistribute the national wealth. Data on fiscal transfers from the central authority to provinces are not available. Thus, the difference between the expenditure and revenue of each province is used as a proxy. From Table 4.1, it can be seen that fiscal transfer from the central authority to locals is much higher in China than in the US, implying a high degree of fiscal integration in China. Secondly, the size of transfer is quite diverse between provinces. In general, provinces around the coastal line require less central transfers than inland ones. Shanghai (13.3 percent), Beijing (18.5 percent), and Guangdong (26.4 percent) have the lowest ratios, whereas Tibet (91.6 percent), Qinghai (68.0 percent), and Nignxia (60.48 percent) have the highest. This means that, in effect, some affluent provinces were subsidizing their less prosperous siblings.

4.2.2 Openness

According to McKinnon (1963), openness matters in forming a currency area because the more open an economy, the larger the proportion of imported goods in price and wage indexes. Thereby monetary policies will be less effective in affecting real wages, and the cost of losing individual monetary autonomy in a union will be smaller. It is unclear how prevalent money illusion is in China's labor market. However, it is observed that state-owned enterprises are under pressure to maintain workers' real incomes against rising living standards (Blejer, Burton et al. 1991).

Openness can be measured by the ratio of external trade to GDP. In terms of the mean value, China is still not as open in 1994 as the US and EC in the 1980s. In fact, in 1994, the EC and US ranged first and second in world merchandise trade, while China ranged only seventh (WTO 1995). The most open provinces are Guangdong (1.68), Beijing (1.00) and Shanghai (0.88), whereas the most closed provinces are Henan (0.08), Qinghai (0.08), and Hunan (0.09).

4.2.3 Factors Mobility

The US is expected to have the highest labor mobility among the three unions, as no legal barrier exits between the states. The EC has also unified the labor markets since 1968, by applying a number of regulations to facilitate labor movement across the community.[2] Nevertheless, labor mobility within the EC is obstructed by invisible barriers such as differences in language, culture, and society security arrangements (Ehrenberg 1994).

In contrast, labor mobility in China is intentionally restricted by the authorities. The purpose is to control the growth of population in city areas. Under the household registration system (*hukou zhidu*), people who want to change registration status are required to obtain permission from the authorities. Before the economic reform, city residences almost completely relied on their affiliated unit (*danwei*) for job replacement, housing, and rationed foods (Yan 1990). The counterpart in rural areas was people communes (*renmin gongshe*). The affiliation and registration systems together provided an effective means of controlling labor migration. Davis (1992) observes that even labor movement between firms in the same city was subject to impediments. Nonetheless, as a consequence of economic reform, the planning system has been giving way to the private market in the provision of foods and jobs. This development has encouraged higher mobility of labor, especially from inland rural to coastal urban areas.

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[2] Spain and Portugal were admitted to the program in 1993.

Comprehensive and systematic reports on inter-province labor migration in China are rare. The 1987 interim census reveals that inter-province migration accounted for only 20.7 percent of internal migrants (Wakabayashi 1990). In due course, the inter-province labor mobility in three major production units – state-owned, urban collective-owned and other ownership units[3] – is used as a proxy. Using this proxy, the mobility of labor in China is estimated to be about 0.06 times of that in the US, and about 0.13 to 0.21 times of that in the EC. Ehrenberg (1994) reports that the labor mobility within the four largest EC members: France (22 regions), Germany (11 Länder), Italy, and the United Kingdom (UK) (10 regions) are 1.3, 1.1, 0.5, and 1.8 respectively, all larger than that in China.[4] It should be pointed out that, as only registered workers are counted, Chinese statistics probably understate the actual mobility.

In general, the more developed provinces like Beijing, Tianjin, Shanghai, Guangdong, and Hainan have larger shares of incoming migrated workers. The island province Hainan gained the status of province only by 1988. Therefore, the large movement of labor might be merely a transitional phenomenon. Excluding Hainan, Guangdong and Beijing have the highest ratios of incoming workers, up to 26 percent and 19 percent, respectively, in 1994. On the other side, less developed provinces like Inner Mongolia, Gansu, Qinghai, Ningxia, and Xinjiang, have larger shares of outgoing migrated workers in their workforces. Excluding Hainan, the highest ratios of outgoing worker are found in Qinghai and Gansu, reaching 47 percent and 19 percent, respectively, in 1994.

Compared to labor, capital is far more homogenous and less inhabitant dependent. However, capital is not necessarily free from provincial barriers. Blejer, Burton et al. (1991) noted that, after a decade of reform, credit was still allocated largely by commands in China. More importantly, local authorities are able to influence the regional branches of the People's Bank of China (PBC) to extend credit to local

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[3] Other ownership units include the following types of enterprises: joint management; stock ownership; and foreign funded, including those from Hong Kong, Macao, and Taiwan.

[4] Northern Ireland is excluded from the estimation of the UK.

enterprises. In this sense, capital is a localized rather than a mobile factor across provinces. An examination of the ratios of inter-province to total local investment for Guangdong, Shaanxi, Beijing, Liaoning and Shanghai during 1985-92 shows that only in Shanghai did this ratio rise significantly (World Bank 1994). The ratios for the first three provinces actually fell. These five provinces accounted for about 30 percent of total national investment.

Another indicator of the degree of capital mobility is the capital return differential across provinces. Over 1986-90, the variation of profit rates of firms across provinces increased from 0.19 to 0.66 (ibid.). Furthermore, it is found that inter-province investment was induced more by tax concession differential than by real difference in capital productivity (ibid.). Lastly, stock and bond markets are supposed to be effective channels of inter-regional investment. However, as they are still considered experimental financial infrastructures by the central authority, they have not been widely adopted.

4.2.4 Commodity Market Integration

Besides labor and capital, goods and materials mobility is also important from the point of view of macroeconomic management. Firstly, materials are essential inputs for production. Secondly, when labor and capital are not mobile enough to equalize disturbances between regions, flows of goods and services can be a substitute. In particular, Frankel and Rose (1996) provide evidence that monetary unification could reinforce correlation of business cycles between member states probably through strengthening intra-union trade. In a microeconomic perspective, intra-province trade allows the exploitation of comparative advantages between provinces and of the benefits of economies of scale.

Notwithstanding, domestic protectionism in China is widely documented; for example, see Goodman (1991), Cannon and Zhang (1996), Hao and Wang (1994), and Breslin (1995). Cannon and Zhang (1996) observe that domestic protectionism has become stronger and more widespread as a consequence of increasing local autonomy. The motivations behind local protectionism are wide ranging. For instance, they include protection of local infant industries, retaining the capacity of exporting and hence of earning foreign exchange, maintaining sufficient local supply and, thus, avoiding inflation. Barriers exist in the forms of tariffs, quantitative controls, or even physical barricades. Breslin (1995) concludes that to a certain extent Chinese provinces are more open toward the outside world than toward each other.

Kumar (1994) provides quantitative evidence for the above observations. He tests for a couple of provinces and finds that while external trade as a percentage of provincial GDP has increased over time, that of inter-province trade has declined in general. The total inter-province trade as a percentage of national GDP in 1988 and 1990 were 21.0 percent and 18.9 percent, respectively, whereas that of the EC in 1989 was 28.3 percent. However, Kumar also provides some possible 'positive' explanations about the decline of internal trade, such as slow growth of a transportation system or an increase in local demand.

Similar to the use of return differential in gauging capital mobility, price differential can be deployed to assess commodity mobility. The World Bank (1994) finds that, for seven daily consumer goods, the standard deviations of prices across provinces in 1991 were all higher than in 1986. On the other hand, that of five production materials fell in general between 1990 and 1992.[5]

4.2.5 Production Diversity

To obtain a rough measurement of production diversity, the output of each province is divided into three broad sectors: primary, secondary, and tertiary industries. Secondary industry consists of heavy and light industries, and construction; and tertiary industry consists of transportation, postal and telecommunication services, and commerce. The relative size of each sector is expressed in percentage of provincial GDP.

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[5] The seven consumer goods include flour, rice, vegetable oil, apples, white cotton cloth, color TV, resident use coal, and kerosene. The five production materials include steel sheet, copper, coal, cement, and timber.

Again, from Table 4.1, it can be seen that the relative size of primary industry in China is much larger than in the US and the EC. The distribution of primary industry is more even in China than in the other two unions. The situation in the tertiary industry is just the opposite. China has a relatively smaller but more locally concentrated tertiary sector. For secondary industry, Kumar (1994) finds that the differentiation of industrial production in China is lower than that in the US and the EC.

The comparative results clearly indicate the difference in the development stage between China and its western counterparts. It also implies that shocks upon the tertiary industry are more vital for China, as they are likely to be more asymmetric than, say, shocks upon the primary industry.

The diversification of provincial production has reduced during 1987-94 for both the secondary and tertiary sectors, and that for primary industry has increased only very marginally. This suggests that China has not exploited the benefits of economies of scale. Some studies investigate the change of components of GDP across provinces and across time instead; the conclusion is similar. For example, Kumar (1994) (and the references cited there) shows that the detailed compositions of provinces are very similar and their similarity has actually increased over the reform period.

4.3 SYMMETRY OF DISTURBANCES

Previous discussion concludes that a single market has not yet formed in China. In terms of production structure, there is a trend of convergence across the provinces. The situation is somewhat like a mirror image of that between Hong Kong and China as a whole. Recall that Hong Kong and China are structurally dissimilar but economically deeply integrated. As discussed at length in the last chapter, similarity in production structure will enhance the correlation of business cycles between the provinces, whilst market fragmentation will dampen the transmission of disturbances across them. The overall result depends on which factor overwhelms the other. This section focuses on the issue by measuring the symmetry of disturbances across provinces. Once again, the Blanchard and Quah (B&Q) (1989) method is deployed. For details of the method and data, refer to the last chapter.

4.3.1 Estimation Results

Table 4.3 reports the correlations of supply shocks. These are mapped into Figure 4.1. A large group of correlated provinces can be identified. They include Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hunan, Guangdong, Guangxi, Yunnan, Gansu, Ningxia, and, to a lesser degree, Shanxi and Sichuan. In 1994, this group of provinces accounted for 60.7 percent of national industrial output.

Table 4.4 reports the correlations of demand shocks. These are mapped into Figure 4.2. A similar, but smaller and much weaker, group of provinces emerge. Anhui, Guangxi, Yunnan are excluded, while Beijing is included marginally. Sichuan becomes more significant, while Gansu becomes a marginal case. In 1994, this core group of provinces accounted for 53.4 percent of national industrial output.

Again, the correlations between the nine European countries (E9) across the period of 1986Q1 to 1993Q3 are used for comparison. As reported in Chapter 3, in terms of supply shock, less than half of the E9 are correlated at a 1 percent level. In terms of demand shock, most are insignificantly correlated. Whitt (1995) finds that in terms of supply shock, the correlation between Germany and four other EC members (the UK, France, Italy and the Netherlands) were -0.08, 0.56, 0.46 and 0.40, respectively. While that of demand shock were -0.32, 0.02, -0.24, and -0.34, respectively. Bayoumi and Eichengreen (1994) use annual data and evidence stronger correlations between European countries. They also find that the correlation of supply shocks between six out of seven US regions ranged from 0.43 to 0.81, and that of demand shocks ranged from 0.43 to 0.79.

When all the Chinese provinces are included, no clear conclusion can be drawn about the relative coherence between them and the E9. Nevertheless, among the 28 provinces, the correlations between certain provinces are comparable to, if not stronger than, those of the E9. The results of Bayoumi and Eichengreen (1994a) seem to suggest that the US regions are more correlated than the Chinese provinces and the EMU members. Nonetheless, the comparison may not be on an equal basis. Bayoumi and Eichengreen

Table 4.3 Correlation of Supply Shocks between Chinese Provinces

	BJ	TJ	HB	SX	IM	LN	JL	HLG	SH	JS	ZJ	AH	FJ	JX	SD	HN	HUB	HUN	GD	GX	SC	GZ	YN	SAX	GS	QH	NX	XJ
Beijing	1.00																											
Tianjin	0.23	1.00																										
Hebei	0.16	-0.29	1.00																									
Shanxi	0.26	-0.01	0.35	1.00																								
Inner Mongolia	***-0.60***	0.17	-0.21	***-0.44***	1.00																							
Liaoning	***0.55***	0.13	0.05	***0.54***	***-0.74***	1.00																						
Jilin	***0.50***	0.39*	-0.23	0.39*	***-0.57***	***0.54***	1.00																					
Heilongjiang	***-0.59***	0.03	-0.11	-0.35	***0.73***	***-0.74***	***-0.47***	1.00																				
Shanghai	0.01	0.21	0.27	0.16	-0.27	0.26	0.14	-0.08	1.00																			
Jiangsu	0.15	***0.49***	-0.29	0.21	-0.34	***0.56***	***0.50***	***-0.48***	0.40*	1.00																		
Zhejiang	0.38*	0.28	-0.08	0.42*	***-0.57***	***0.67***	***0.64***	***-0.63***	0.43*	***0.72***	1.00																	
Anhui	0.19	0.16	-0.19	0.33	***-0.55***	***0.44***	***0.81***	***-0.45***	0.27	***0.57***	***0.72***	1.00																
Fujian	0.42*	0.23	0.10	***0.52***	***-0.71***	***0.58***	***0.72***	***-0.65***	0.38*	***0.52***	***0.66***	***0.75***	1.00															
Jiangxi	0.30	0.36	0.09	0.42*	***-0.58***	***0.54***	***0.59***	-0.30	***0.53***	***0.45***	***0.57***	***0.54***	***0.71***	1.00														
Shandong	0.31	0.18	-0.27	0.38*	***-0.62***	***0.65***	***0.64***	***-0.55***	0.39*	***0.71***	***0.64***	***0.68***	***0.63***	***0.63***	1.00													
Henan	0.25	0.09	0.05	***0.60***	***-0.56***	***0.56***	***0.60***	***-0.48***	0.24	***0.45***	***0.54***	***0.56***	***0.64***	***0.60***	***0.71***	1.00												
Hubei	0.10	-0.14	0.30	***0.52***	-0.11	-0.05	0.22	-0.02	0.17	-0.04	0.16	0.32	0.31	0.08	0.21	0.41*	1.00											
Hunan	0.42*	0.17	0.30	***0.56***	***-0.67***	***0.62***	***0.54***	***-0.61***	***0.46***	***0.57***	***0.63***	***0.48***	***0.69***	***0.68***	***0.71***	***0.78***	0.31	1.00										
Guangdong	0.26	0.37*	-0.14	0.37*	***-0.51***	***0.69***	***0.56***	***-0.66***	0.42*	***0.77***	***0.76***	***0.60***	***0.73***	***0.58***	***0.71***	***0.55***	-0.01	***0.57***	1.00									
Guangxi	0.35	***0.55***	-0.05	0.37*	***-0.44***	***0.70***	0.41*	-0.39*	***0.57***	***0.75***	***0.66***	0.36	***0.56***	***0.65***	***0.53***	0.35	-0.11	***0.52***	***0.69***	1.00								
Sichuan	0.23	-0.07	0.20	***0.51***	***-0.55***	***0.65***	0.29	***-0.59***	0.42*	0.43*	***0.56***	0.34	***0.52***	***0.49***	***0.64***	***0.77***	0.22	***0.82***	***0.58***	0.41*	1.00							
Guizhou	0.20	-0.08	0.37*	***0.48***	-0.32	0.32	0.09	-0.19	0.41*	0.12	0.40*	0.21	0.29	0.17	0.10	-0.02	0.25	0.12	0.34	0.41*	0.16	1.00						
Yunnan	0.36	0.36	0.01	***0.59***	***-0.53***	***0.51***	***0.66***	-0.39*	0.34	***0.45***	0.43*	***0.55***	***0.64***	***0.66***	***0.70***	***0.64***	0.24	***0.61***	***0.59***	***0.53***	0.39*	0.20	1.00					
Shaanxi	0.30	0.16	0.01	-0.03	***-0.51***	0.22	0.28	-0.27	***0.44***	***0.47***	0.28	0.43*	***0.48***	0.39*	***0.57***	0.14	0.14	***0.46***	0.34	0.43	0.20	0.21	0.41*	1.00				
Gansu	***0.52***	0.27	-0.15	***0.63***	***-0.64***	***0.76***	***0.72***	***-0.54***	0.05	0.42*	***0.58***	***0.49***	***0.67***	***0.60***	***0.56***	***0.60***	0.13	***0.56***	***0.51***	***0.61***	***0.45***	0.23	***0.55***	0.16	1.00			
Qinghai	0.22	0.21	0.13	-0.12	0.05	0.02	0.26	0.01	0.24	0.02	0.23	0.27	0.02	0.10	0.02	0.09	0.21	0.13	-0.16	0.05	0.07	0.03	-0.01	0.05	0.01	1.00		
Ningxia	***0.45***	-0.13	0.29	***0.62***	***-0.76***	***0.64***	0.40*	***-0.53***	0.43*	0.41*	***0.63***	***0.51***	***0.56***	***0.49***	***0.65***	***0.60***	0.32	***0.74***	***0.45***	***0.47***	***0.69***	0.43*	***0.55***	***0.47***	***0.48***	0.06	1.00	
Xinjiang	-0.01	-0.10	0.19	-0.09	0.01	-0.23	-0.35	0.14	0.07	-0.16	-0.14	-0.16	-0.17	-0.11	-0.08	-0.42*	-0.02	-0.14	-0.11	0.00	-0.21	***0.48***	0.07	***0.46***	-0.27	-0.09	0.13	1.00

Underline, highlighting, Italian bold, and asterisk (*) denotes significant at 0.1, 1, 5 and 10 percent level respectively. With 20 observations, the corresponding critical values of two-tails tests are ± 0.74, ± 0.58, ± 0.44, and ± 0.37 respectively. Testing periods for zero lag is 1990Q2-1995Q1, for 1 lag is 1990Q3-1995Q2 etc., with 20 net observations.

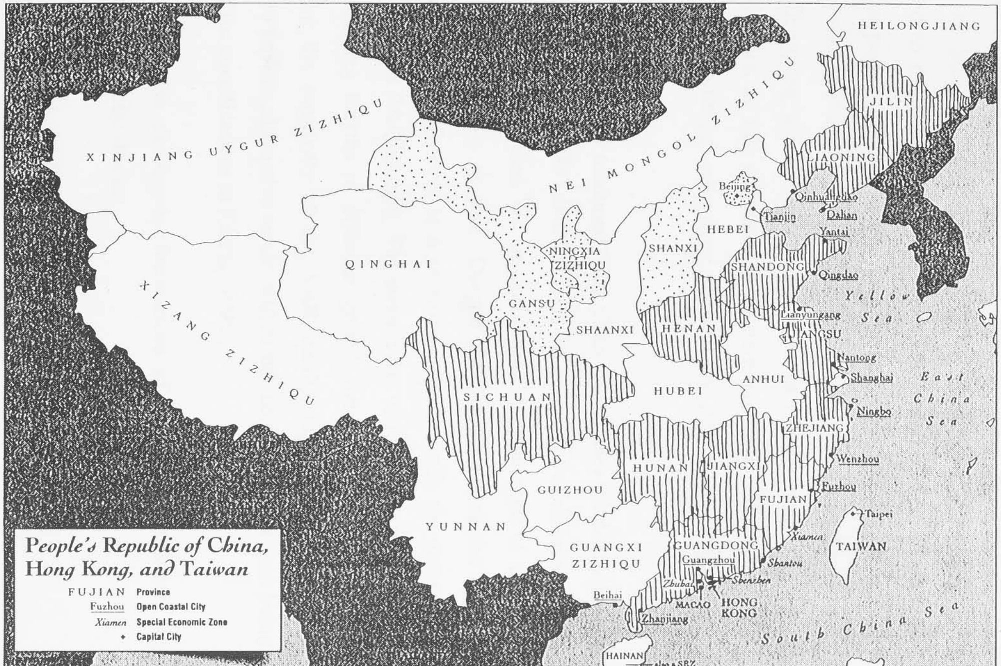
Figure 4.1: Correlated Chinese Provinces in Supply Shocks

Table 4.4 Correlation of Demand Shocks between Chinese Provinces

	BJ	TJ	HB	SX	IM	LN	JL	HLG	SH	JS	ZJ	AH	FJ	JX	SD	HN	HUB	HUN	GD	GX	SC	GZ	YN	SAX	GS	QH	NX	XJ
Beijing	1.00																											
Tianjin	-0.08	1.00																										
Hebei	-0.33	0.35	1.00																									
Shanxi	0.00	0.10	0.27	1.00																								
Inner Mongolia	0.20	0.11	-0.12	***0.45***	1.00																							
Liaoning	***0.58***	0.10	***-0.53***	0.20	0.31	1.00																						
Jilin	***0.48***	0.01	-0.24	0.23	0.04	0.33	1.00																					
Heilongjiang	-0.29	-0.11	0.26	0.20	0.14	-0.21	-0.27	1.00																				
Shanghai	0.07	***0.41***	0.24	0.40*	0.03	0.33	0.15	-0.18	1.00																			
Jiangsu	0.42*	0.11	-0.35	0.38*	0.38*	***0.52***	***0.64***	0.00	-0.11	1.00																		
Zhejiang	***0.56***	-0.03	***-0.49***	0.36	0.21	***0.71***	***0.63***	-0.13	0.32	***0.58***	1.00																	
Anhui	0.23	-0.12	-0.09	-0.04	0.15	0.23	0.29	-0.01	-0.07	0.13	0.31	1.00																
Fujian	0.26	-0.07	-0.25	0.42*	0.12	***0.46***	***0.56***	0.00	***0.50***	0.43*	***0.75***	0.16	1.00															
Jiangxi	***0.44***	-0.17	-0.26	0.19	0.13	0.38*	***0.65***	-0.27	0.00	***0.45***	0.40*	0.37*	0.25	1.00														
Shandong	0.11	-0.01	***-0.57***	0.28	0.38*	***0.48***	***0.45***	-0.03	0.19	***0.46***	***0.56***	0.04	***0.57***	0.20	1.00													
Henan	0.40*	-0.07	-0.19	0.08	-0.24	0.25	***0.58***	-0.27	0.27	0.33	***0.55***	0.20	0.42*	***0.48***	0.24	1.00												
Hubei	0.05	-0.10	***0.51***	0.43*	-0.01	-0.04	-0.03	0.12	***0.45***	-0.10	0.10	-0.02	0.29	-0.12	-0.24	0.30	1.00											
Hunan	0.21	-0.12	-0.40*	0.31	0.29	0.39*	***0.56***	0.19	0.05	***0.65***	***0.54***	0.15	***0.74***	0.21	***0.67***	0.18	-0.10	1.00										
Guangdong	***0.57***	0.07	-0.13	0.07	0.15	***0.44***	***0.68***	-0.13	0.20	***0.51***	0.38*	0.31	0.38*	0.40*	0.24	0.20	-0.13	***0.50***	1.00									
Guangxi	-0.09	0.15	0.20	0.22	0.30	-0.16	0.05	0.19	-0.09	0.25	-0.11	-0.18	0.16	-0.21	0.17	-0.32	-0.04	***0.54***	0.17	1.00								
Sichuan	0.29	0.18	***-0.44***	0.16	0.20	0.43*	***0.55***	-0.33	0.25	0.43*	***0.53***	0.13	***0.47***	***0.59***	***0.56***	***0.62***	-0.20	0.36	0.24	-0.22	1.00							
Guizhou	-0.27	0.21	***0.56***	***0.45***	0.06	-0.33	-0.26	0.19	***0.46***	-0.38*	-0.15	0.01	0.17	-0.14	-0.10	-0.02	0.35	-0.14	-0.26	0.06	0.07	1.00						
Yunnan	***0.45***	-0.25	-0.20	0.03	0.11	0.06	***0.49***	-0.41*	0.15	0.04	0.30	0.18	0.35	0.26	0.13	0.14	0.00	0.31	0.34	0.16	0.15	-0.05	1.00					
Shaanxi	-0.27	0.06	0.26	***0.50***	0.08	-0.07	0.19	0.31	0.05	0.25	0.24	0.24	0.27	-0.10	0.11	0.10	0.36	0.19	-0.19	0.00	-0.01	0.21	-0.04	1.00				
Gansu	0.12	0.08	-0.08	***0.60***	0.39*	0.21	***0.57***	0.04	0.24	***0.61***	***0.54***	-0.19	***0.61***	0.19	0.43*	0.20	0.18	***0.60***	0.25	0.36	0.34	-0.03	0.39*	0.39*	1.00			
Qinghai	0.18	0.12	0.37*	0.21	-0.07	-0.14	0.34	-0.05	0.28	0.03	0.12	0.24	0.19	0.25	-0.10	***0.58***	***0.59***	-0.08	0.01	-0.15	0.21	0.29	0.07	0.22	0.07	1.00		
Ningxia	-0.13	-0.14	-0.11	***0.55***	0.40*	0.16	0.43*	0.08	-0.09	***0.63***	0.31	0.07	0.43*	0.29	***0.47***	0.09	0.12	***0.53***	0.12	0.28	0.26	-0.11	-0.02	***0.53***	***0.58***	0.14	1.00	
Xinjiang	0.16	0.23	0.31	0.18	-0.37*	0.03	0.29	-0.24	***0.50***	-0.05	0.32	0.21	0.34	0.13	-0.08	***0.65***	***0.48***	-0.05	-0.07	-0.15	0.28	0.38*	0.23	0.38*	0.10	***0.62***	-0.08	1.00

Underline, highlighting, Italian bold, and asterisk (*) denotes significant at 0.1, 1, 5 and 10 percent level respectively. With 20 observations, the corresponding critical values of two-tails tests are ± 0.74, ± 0.58, ± 0.44, and ± 0.37 respectively. Testing periods for zero lag is 1990Q2-1995Q1, for 1 lag is 1990Q3-1995Q2 etc., with 20 net observations.

Figure 4.2: Correlated Chinese Provinces in Demand Shocks



10% significance level

5% significance level

(1994a) use annual data and group the 30 states of the US into only seven regions, some short-term intra-regional asymmetry might be averaged out.

4.3.2 Sensitivity Tests

Again, to ensure the robustness of the results, their sensitivity in respect to different lag lengths is tested. The exercise is repeated by selecting the lags for individual provinces according to the Akaike's information criterion (AIC). As mentioned in the previous chapter, all lags suggested by the AIC are very short, either one or two months. Compared to the previous 12 lags, it can be considered an extreme test case. The correlation patterns become sharper than in the case of uniform 12 lags. The correlation of supply shocks clearly divides China almost exactly into a western and eastern sphere, with Heilongjiang and Guangxi at the ends of the diagonal. The only exception is Sichuan, which is still correlated to eastern provinces. The correlation patterns of demand shocks changes even more dramatically. Almost all the provinces are strongly correlated.

In the last chapter, it is mentioned that Chan (1996) uses the decomposition method of Cohen and Wyplosz (1989) to disentangle the correlation of disturbances between Hong Kong and other economies. We are not aware of any attempts to apply this method on the Chinese provinces to date. Despite the limitations of the method mentioned previously, it can still serve as a sensitivity test to verify the groupings of provinces suggested by the B&Q method. The method has various estimation specifications, such as different lag lengths or different growth trends. Since it is for the purpose of illustrating the sensitivity of the VAR results, any plausible specifications which manage to provide alternative results will fulfill the purpose. The one being chosen here is one of the specifications in Karras (1996).

The method is to decompose fluctuations of output and inflation separately into common and specific shocks:

$$x_{it} = w_i + \rho_{i1} x_{it-1} + \rho_{i2} x_{it-2} + .. + \rho_{ik} x_{it-k} + c_t + s_{it};$$

where the subscript i and t denote province and time respectively. x is the change of logarithm output (Δy) or inflation ($\Delta^2 p$); w is the real growth rate; c is a common shock; and s is a specific shock. The lag terms of x are to capture the persistence of shocks. Three and two lags are used in the output and inflation regressions, respectively.

Common shocks are those that affect all provinces to the same degree, specific shocks affect individual provinces only. The more effective the transmission of shocks across provinces, the more dominant common shocks relative to specific shocks will be. It is found that the ratio of the variances of common to specific inflation shocks ranges from 12.5 for Inner Mongolia to 1.3 for Beijing. The ratios for all but nine provinces are actually above 3.3. On the other hand, that for output shocks ranges from 2.3 for Hebei to 0.2 for Jiangsu. The ratios for only three provinces are above 1.0, while those for 12 provinces are below 0.5.

Furthermore, the more effective the transmission between two provinces, the stronger the correlation of their specific shocks will be. Since the variance ratios of common to specific output shocks are generally small, the correlation of output specific shocks becomes more important. Two groups of provinces with strong correlation can be identified: (i) Liaoning, Zhejiang, Anhui, Fujian, Jiangxi and Hunan; and (ii) Guizhou, Shaanxi, Gansu, Qinghai and Xinjiang. The first group is located in eastern China, while the second group is in western China. More interestingly, these two groups are roughly significantly negatively correlated to each other.

In terms of correlation of specific inflation shock, three groups of integrated provinces can be identified: (i) Beijing, Tianjin, Shanghai and Guangdong; (ii) Jiangsu, Zhejiang and Anhui; and (iii) Hunan, Sichuan and Guangxi. The composition of the first group is tangible, as the members are the most open provinces. The second and third groups of provinces are close neighbors in eastern and northern China, respectively.

Overall, the regional groupings identified both by using shorter lag lengths and by the univariate method are quite different from the previous findings. It means that any conclusions about regional integration will, at most, be suggestive. On the other hand, a small group of provinces, which are consistently strongly correlated under most estimation specifications, can be identified. They include Jiangsu, Zhejiang, Anhui, Jiangxi, Fujian, and Hunan. They are close neighbors in eastern China.

4.4 CONCLUSIONS

Tests of selective OCA criteria suggest that a single market has not yet formed in China. As described by the World Bank (1994), China is an economy where "major elements of economic union including a single currency and a common external tariff are combined with a lack of some basic features of a free trade area, such as the free movement of goods and factors". Nevertheless, one of the definitive features of a currency area is the free flow of capital (Cohen 1994). Even if the Chinese provinces are using a single legal tender, capital is not perfectly mobile between them. Therefore, China is not quite a currency area either.

Despite the heterogeneity of the Chinese provinces, based on the selective OCA criteria, a group of more developed provinces can be identified; these include Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. They are all characterized with high per capita GDP, relatively large secondary and tertiary industries (and, thus, a small primary industry),[6] high openness, and low dependence on fiscal transfers from the central government. The only item that does not match this general regional pattern is labor mobility. This is because labor mobility takes into account both incoming and outgoing labor. As far as the size of incoming labor is concerned, this group of provinces has outstandingly high levels.

Nevertheless, using symmetry of disturbances as a gauge of economic integration indicates different groupings of provinces. It is found that the shocks experienced by the provinces are not uniformly correlated. Different estimation specifications suggest different groupings of provincial economies. However, it is found that a group of several eastern provinces are consistently strongly correlated. The group consists of Jiangsu, Zhejiang, Anhui, Jiangxi, Fujian, and Hunan. The result suggests that treating China as an integrated economy might be misleading not only at the micro level, but also at the macro level, especially in understanding its business cycles.

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[6] A more detailed breakdown will show that the secondary industries of this group of provinces are dominated by light rather than heavy industries.

Overall, the finding rejects the proposition that China constitutes an OCA. Hence, it casts doubts on the effectiveness of using uniform monetary policies to manage the macroeconomic activities of the highly heterogeneous Chinese provinces. The segregation between provinces attributes to distorting local policy regimes as much as, if not more than, structural differences. The experience of the EMU shows that forming a common market should be a prerequisite for adopting a single currency (Bayoumi and Eichengreen 1997). In the case of China, a single currency has long been in place, but a truly common market is still not in sight. The comparison reconfirms that encouraging thorough economic decentralization but avoiding over administrative decentralization is the key to delivering the benefits of economic reform.

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Chapter 5

Choices of Nominal Anchors & Entrepot Trade

Synopsis 5

This chapter considers a special but ignored issue in the literature of trade and exchange rate regimes, namely the interrelation between entrepot trade and monetary standard. A theoretical three-country model is constructed to illustrate the role of entrepot trade in the choices of monetary standard for small open economies. Analytical results demonstrate that trade structure can substantially change the impact of exogenous shocks on a small open economy. Most importantly, it is found that the current structure of indirect trade between the United States (US), Hong Kong and China could reduce the opportunity cost of choosing between the US dollar and the renminbi as the nominal anchor for the Hong Kong dollar.

5.1 INTRODUCTION

Since the onset of the Asian financial crisis in mid-1997, the currency board system in Hong Kong had been under severe pressure. There were rumors that Hong Kong would eventually switch from the US dollar zone to the Chinese renminbi zone, and thus demolish the link with the greenback. Although the speculative attacks against the Hong Kong dollar were ultimately deterred by August 1999, the crisis sparked a lot of debate in relation to whether the exchange rate parity with the US dollar is sustainable and beneficial for Hong Kong in the long term.

One criticism of the prevailing system is that pegging the Hong Kong dollar to a strong US dollar will weaken the export competitiveness of Hong Kong. However, the government has pronounced that, because Hong Kong trade is dominated by entrepot trade, the choice of the nominal anchor is irrelevant to export competitiveness. This view is shared by some private investors; for example, see Hong Kong Bank (1997a).

In the literature of monetary standard, trade is considered a major factor in determining the nominal anchor. A typical proposition being if a small country decides to peg its currency to a foreign currency, it should choose the currency of its largest trading partner, or if there is no single dominant partner, a basket of the currencies of all its major partners. The rationale is, *ceteris paribus*, a more stable exchange rate will help enhance trade and investment. Therefore, pegging to the largest trading partner, or to a basket of all the major partners, will maximize the benefits.

If the small country has a weak capacity to conduct stabilizing macroeconomic policies, pegging the domestic currency to a reputed currency also helps strengthen its credibility. This is essentially the idea behind the currency board arrangements of some inflation-prone economies like Argentina and Estonia (Balino and Enoch 1997). However, it can work the opposite way, in that the peg amplifies the spillover effects of domestic monetary disturbances in the anchor country.

The literature on choices of exchange regimes for small open economies is extremely rich. In most studies, direct trade is assumed and indirect trade is ignored. Such an assumption is justifiable for most countries, as indirect trade is usually negligible when compared with direct trade. However, the situation is significantly different for Hong Kong. In 1998, the total value of Hong Kong re-exports was about 6.2 times that of direct exports, placing Hong Kong at the top of the world list of entrepots. In terms of value-added, the contribution of re-exports to the gross domestic product (GDP) was about 16 to 17 percent (Dodsworth and Mihaljek 1997), more than double that of direct exports.[1] In fact, the sizable indirect trade between the US and China via Hong Kong is a key factor underlying the dispute over the trade balance between the two economies (Fung and Lau 1999).

The distinct trade structure of Hong Kong adds a new aspect to the old topic of choice of monetary standard. It raises the question of whether entrepot trade affects, or even changes, the choice of the nominal anchor for small open economies under fixed exchange rate regimes.

At first glance, a fundamental difference between direct trade and entrepot trade is that the former involves only two countries, and therefore a single exchange rate, while the latter involves three countries, and two exchange rates. Unless its trading partners peg their currencies together, the entrepot can not expect to gain the benefits of exchange rate stability on both sides.

Furthermore, in terms of the transmission of exogenous disturbances, the presence of entrepot trade might complicate the mechanism. Consider the impacts of a fiscal expansion in the US on the trade flows between the US, Hong Kong and China under the Mundell-Fleming model framework. The first case is purely direct trade. In the short run, due to price rigidity, the US dollar appreciates against the renminbi. At the same time, the US increases imports from Hong Kong, due to higher income. If the Hong Kong dollar is pegged to the renminbi it will depreciate against the US dollar. So both the income and substitution effect will increase demand for Hong Kong export. If the Hong Kong dollar is pegged to the US dollar it will appreciate against the renminbi and export demand from China will be reduced. The world interest rate will go up in both

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[1] Another IMF study states that the contribution of re-exports to the GDP is only about 13 percent (Mihaljek, Hussain et al. 1998:20).

cases. Overall, the pressure on the output of Hong Kong will be larger if the Hong Kong dollar is pegged to the renminbi.

In the case of entrepot trade, if the Hong Kong dollar is pegged to the renminbi, both the Hong Kong dollar and the renminbi will depreciate against the US dollar. As a result, indirect exports from China to the US will increase, but those of the US to China will reduce. As before, there will be greater demand from the US for the direct exports of Hong Kong and a higher world interest rate. The overall impact on Hong Kong is thus ambiguous. On the other side, if the Hong Kong dollar is pegged to the US dollar, when both the Hong Kong dollar and US dollar appreciate against the renminbi, the indirect exports of China to the US will increase, and those of the US to China will decrease. Again, the overall result is indeterminate. Under either fixed exchange rate regime, the impact on the output of Hong Kong depends on the relative size of its re-exports to the US and China, respectively, and on the relative size of its direct exports and re-exports.

The above simple example illustrates that involving one more trading partner actually creates several more channels to transmit disturbances across countries, making the choice of the optimal nominal anchor less obvious than in the case of purely direct trade. Indeed, this paper argues that trade structure can substantially change the impacts of exogenous disturbances on a small economy and its opportunity cost of choosing one foreign currency instead of another as the nominal anchor.

There are a number of studies about the trade structure of Hong Kong, including Hsia (1984), Sung (1988), Sung (1991), Sung (1995), Sung (1998), Soesastro (1992) and Tuan and Ng (1998). Nevertheless, regarding the choice of exchange rate regime for entrepots, Tom (1989) and Tom (1964) are the only two noticeable studies. However, both studies focus on the situation before the 1950s.

This chapter examines how indirect trade affects the impacts of exogenous shocks on an entrepot and its choice of the nominal anchor, should it decide to adopt a fixed exchange rate regime. The indirect trade between the US, China and Hong Kong, as well as the controversy over the US dollar versus the renminbi as the nominal anchor for the Hong Kong dollar, provide a useful case study to illustrate the arguments. This study aims only to point out the importance of entrepot trade, and the trade structure in general, in the consideration of the exchange rate regime from a theoretical perspective rather than attempting to pick the favorite between the US dollar and renminbi zone.

The rest of the chapter is organized as follows. Section 2 provides some background about indirect trade between the US, China and Hong Kong; Section 3 reviews the limited literature on the issue from a historical perspective; Section 4 puts forwards a three-country model to examine the issue; Section 5 discusses the results; and Section 6 concludes the study by drawing some implications from the findings, and pointing out possible further improvements for the model.

5.2 ENTREPOT TRADE IN HONG KONG

It is useful to first clarify some of the terminology. In this thesis, "entrepot trade" and "indirect trade" are used interchangeably, and so are "re-export" and "indirect export," and "domestic export" and "direct export," respectively.

According to the Census and Statistics Department of Hong Kong (1997:34), re-exports are "products which have previously been imported into Hong Kong and which are re-exported without having undergone in Hong Kong a manufacturing process which has changed permanently the shape, nature, form or utility of the product." Sung (1991) categorizes entrepot trade as being where a third party (i.e. entrepot trader) has held the legal possession of the goods at certain stages. As a result, both transshipment (i.e. via Hong Kong with through bills of lading) and direct shipment (i.e. without touching Hong Kong) are excluded from the official external trade figures and treated as separate items from entrepot trade in Sung (1991).[2]

Whether such precise and restrictive categorizations are necessary depends on the task at hand. Entrepot trade is essentially trade in intermediary services, which includes communications, transportation, financing, insurance, marketing and packaging. Those services are embodied in the traded goods and usually not traded separately (Sung 1998). Therefore, separating transshipment and direct shipment from conventional merchandise entrepot trade risks missing part of the picture. Indeed, as far as the

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[2] More about transshipment and direct shipment is discussed below.

mechanism and implication of the model developed in this study are concerned, any form of intermediary services provided by the entrepot should be taken into account.

5.2.1 China Factor

There are only a handful of countries that have noticeable re-export sectors, compared with their direct export sectors. Table 5.1 reports the ratios of re-exports to direct exports of the top eight countries whose data are available. Only the first four countries have ratios greater than 0.1, with the performance of Hong Kong being the most outstanding.

Table 5.1: Re-export to Domestic Export Ratio

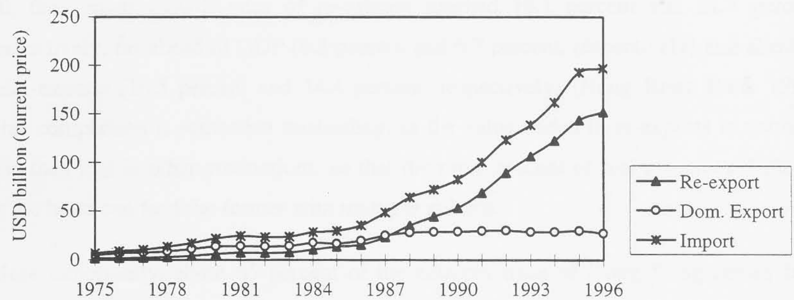
	Hong Kong	Cyprus	Singapore	Jordan	US	Australia	New Zealand	Dominica
1980	0.44		0.61	0.40	0.02	0.03	0.04	0.04
1985	0.81		0.54	0.20	0.03	0.03	0.03	0.08
1990	1.83	0.66	0.52	0.15	0.05	0.07	0.04	0.04
1991	2.31	0.78	0.54	0.27	0.05	0.07	0.05	0.05
1992	2.95	0.96	0.56	0.25	0.05	0.10	0.04	0.01
1993	3.69	1.09	0.58	0.22	0.06	0.09	0.04	
1994	4.27	1.17	0.66	0.24	0.06	0.05	0.04	0.02
1995	4.80	1.33	0.70	0.24	0.07	0.06	0.04	0.04
1996	5.59		0.71					
1997	5.89							
1998	6.15							

Source: various issues of the Yearbook of Statistics of Singapore; International Economic Data Bank, Australian National University; the Census and Statistics Department of Hong Kong.

As mentioned, the statistics of Hong Kong do not include direct shipment and transshipment. With an annual growth rate of up to 15 percent, outward transshipment and seaborne exports have been evolving into a significant component of the services exported by Hong Kong (Tuan and Ng 1998). In other words, the official figures do not fully reflect the middleman capacity of Hong Kong when a broader definition of entrepot trade is used.

Figure 5.1 illustrates the development of entrepot trade in Hong Kong. During the 1960s and 1970s, the exports of Hong Kong were dominated by domestic manufactured products. In 1978, the year before China launched the open-door policy, the gross value of the re-exports of Hong Kong was only 32 percent of that of domestic exports. But as economic reform rooted in China re-exports picked up rapidly. In 1988, the gross value of re-exports bypassed that of direct exports for the first time, and grew almost at an exponential rate thereafter.

Figure 5.1: Re-exports, Domestic Exports and Imports of Hong Kong



Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm).

(a) Figures are in current value.

The rapid growth of re-exports since the 1980s is primarily ascribed to the migration of the Hong Kong manufacturing industry to the Pearl River Delta region to take advantages of its abundant factor resources (Tuan and Ng 1998). By the end of 1991, it is estimated that in Guangdong alone, Hong Kong firms operated about 14,000 enterprises and employed about 3 million workers, more than half the then Hong Kong population (Dodsworth and Mihaljek 1997)! On the other hand, by freeing up resources from upstream manufacturing production, Hong Kong has been able to specialize in downstream trade services in which it has plentiful expertise and efficient infrastructure.

The flourishing of entrepot trade in Hong Kong has not only come with the opening of the Chinese economy, but also with the decentralization of foreign trade in China. Before 1979, almost all foreign trade was monopolized by just ten state trading corporations; by 1984, the number of trading corporations had mushroomed to 1000 (Sung 1998). The fact that trading agencies have been increasingly scattering in China raises the searching cost and the demand for an intermediary. Due to geographical proximity, cultural affiliation, and abundant trading expertise, Hong Kong has every comparative advantage to be the middleman between China and the rest of the world.

5.2.2 Outward Processing Related Trade

The shift of resources from domestic exports to re-exports boosts the trade figures of Hong Kong spectacularly in gross value terms. During the periods 1970-80 and 1980-90, the annual growth rates of re-exports reached 16.1 percent and 22.8 percent, respectively, far ahead of GDP (9.3 percent and 6.7 percent, respectively) and ahead of total exports (10.5 percent and 14.4 percent, respectively) (Hong Kong Bank 1992). This comparison is somewhat misleading, as the value-added in re-exports is normally less than that in other productions, so that the same amount of real resources deployed in the latter can feed the former with multiple volume.

More importantly, about 65 percent of the entrepot trade of Hong Kong comes from outward processing activities (Sung 1998:75).[3] That is, manufacturers import semi-products and materials from other countries via Hong Kong to China, and then export the final products via Hong Kong to other countries. Consequently, there is double counting in outward processing related trade (OPRT). Table 5.2 demonstrates that during the period 1978-96 total exports of Hong Kong grew at an average annual rate of 16.5 percent; however, after adjusting for OPRT, the growth rate of the total exports of final goods was only 10.4 percent.

The double counting problem due to OPRT also distorts the rankings of Hong Kong's trading partners. Table 5.2 shows that unadjusted trade figures suggest that, by 1996, China had already bypassed the US as the foremost market for Hong Kong exports (34.3 percent versus 21.2 percent). But the adjusted figures indicate the US was still the largest end-user market for the territory (25.2 percent versus 21.9 percent).

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[3] In 1997, 76.1 percent of the domestic exports and 44.7 percent of the re-exports of Hong Kong to China were related to outward processing (Sung 1998). At the same time, 81.2 percent of the imports from

Table 5.2: Growth Rate and Market Share of Hong Kong Exports

	Growth rate (%)	Market Share (%)							
	Total	US		China		Japan		EU	
	1978-96	*1978*	*1996*	*1978*	*1996*	*1978*	*1996*	*1978*	*1996*
Domestic exports	6.6	37.2	25.4	0.2	29.0	4.6	5.3	26.7	17.4
Domestic exports of final goods [a]	5.3	37.2	31.9	0.2	11.0	4.6	6.7	26.7	21.9
Total exports	16.5	30.3	21.2	0.5	34.3	7.7	6.5	21.7	14.9
Total exports of final goods [b]	10.4	30.3	25.2	0.5	21.9	7.7	7.9	21.7	17.7

Source: Sung (1998).

(a) Domestic exports of final goods equal domestic exports minus domestic exports to China involving outward processing.

(b) Total exports of final goods equal total exports minus total exports to China involving outward processing.

5.2.3 Value-added

Re-exports dominate the trade of Hong Kong not only in terms of gross value, but also in terms of total value-added. Surveys conducted by the Census and Statistics Department of Hong Kong indicate that in 1989 the margins of the re-exports of Chinese origin and other origins, comparably, stood at 13.0 percent and 11.5 percent, respectively (Sung 1998). Since then the former increased rapidly, reaching 34.4 percent in 1996, while the latter declined to 6.6 percent; together they gave an average value of 21.4 percent (ibid.).

The reason why the markup associated with Chinese exports has increased so much is not clear, given that the Hong Kong middleman market is seemingly open and competitive. Possible explanations include that part of those markups are actually returns of Hong Kong's investments in China, and Chinese exporters trying to transfer capital out of the country illegally via under-invoicing (Fung and Lau 1999).

China to Hong Kong and 88.4 percent of the re-exports of Chinese origin were outward processing related.

Since the value of the re-exports of Hong Kong is over six times that of domestic exports, using the average value of re-export margins of 21.4 percent, the total value-added of the former is about 120 percent of the latter. Nonetheless, since Hong Kong virtually does not produce any raw materials, its value-added in domestic exports is unlikely to be 100 percent. Sung (1988) estimates that during 1977-84 the value-added of Hong Kong in its manufactured goods was only about 30 percent. Supposing the figure remains steady, the total value-added of re-exports is about 400 percent of domestic exports. If one deflates the volume of re-exports to take into account the double counting in OPRT, the total value-added of the former is still about 270 percent of the latter.[4]

5.2.4 Trading Partners

China, the US, the European Union (EU), and Japan are Hong Kong's largest trade partners, for both domestic exports and re-exports. For these four destination countries, the ratios of the re-exports to direct exports of Hong Kong basically follow the overall trend, that is starting to rise since the mid 1980s (Figure 5.2). This is because China has made use of Hong Kong as a springboard for its products to the other three economies, as well as to channel imports from them.

The ratio for China exhibits some irregularities. This is because, before the 1980s, both the direct exports and re-exports from Hong Kong to China were so small (Figures 5.3 and 5.4) that the ratio becomes very sensitive to slight changes of either component.

Figures 5.3, 5.4 and 5.5 portray the growing significance of China, relative to other countries, as the primary trading partner of Hong Kong. The share of China in the total trade of Hong Kong rose spectacularly from 6.4 percent in 1980 to over 34 percent in 1996 (Hong Kong Bank 1997b). The second most important trading partner is the US. The re-exports of Hong Kong have been increasingly concentrated on the big four partners, compared to domestic exports and imports.

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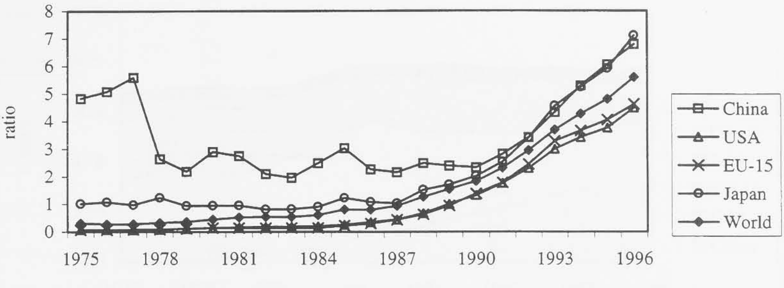
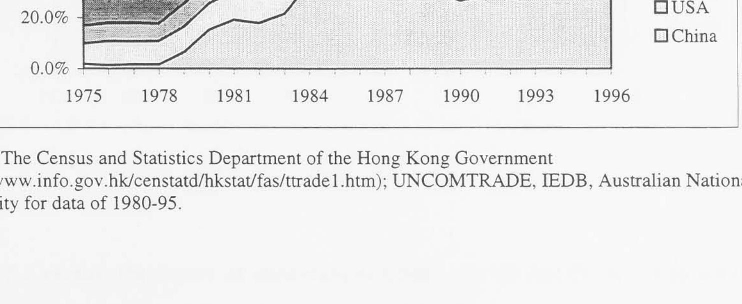
[4] This figure comes from the fact that about 65 percent of the entrepot trade of Hong Kong is related to outward processing. If one reduces the volume of OPRT by half, then the ratio of the total value-added of re-exports over that of domestic exports is equal to (65%*6*0.5+35%*6)*0.2/0.3 = 270%.

Figure 5.2: Re-exports to Domestic Exports Ratio (Hong Kong to Destination Countries)



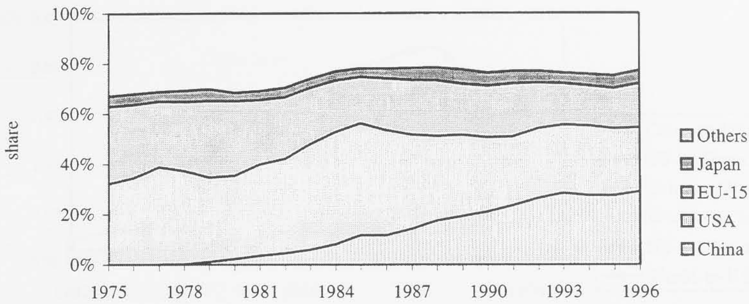
Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm); UNCOMTRADE, IEDB, Australian National University for data of 1980-95.

Figure 5.3: Share of Re-exports of Hong Kong by Destination Countries



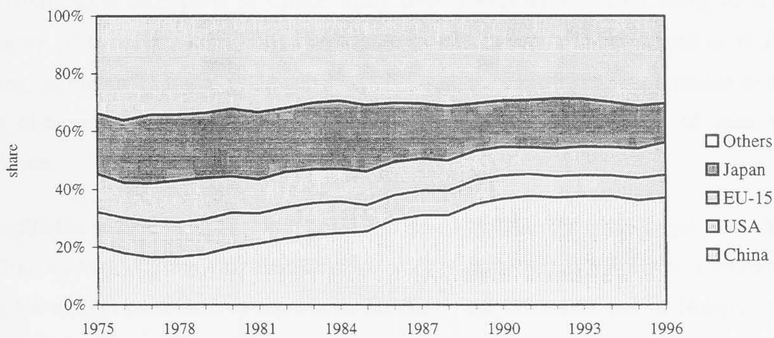
Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm); UNCOMTRADE, IEDB, Australian National University for data of 1980-95.

Figure 5.4: Share of Domestic Exports of Hong Kong by Destination Countries



Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm); UNCOMTRADE, IEDB, Australian National University for data of 1980-95.

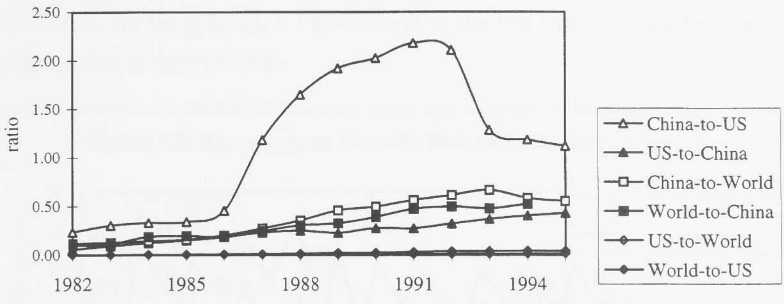
Figure 5.5: Share of Imports of Hong Kong by Source Countries



Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm); UNCOMTRADE, IEDB, Australian National University for data of 1980-95.

Figure 5.6 reveals the degree of utilization of China, the US and the world as a whole, on the entrepot services of Hong Kong, respectively. The curve "China-to-US" denotes the ratio of the indirect exports via Hong Kong over the direct exports of China to the US, and so forth. The larger the ratio, the more the source country makes use of Hong Kong for its exports to the destination country.

Figure 5.6: Ratio of Indirect Exports via Hong Kong to Direct Exports



Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm); UNCOMTRADE, IEDB, Australian National University for data of 1980-95.

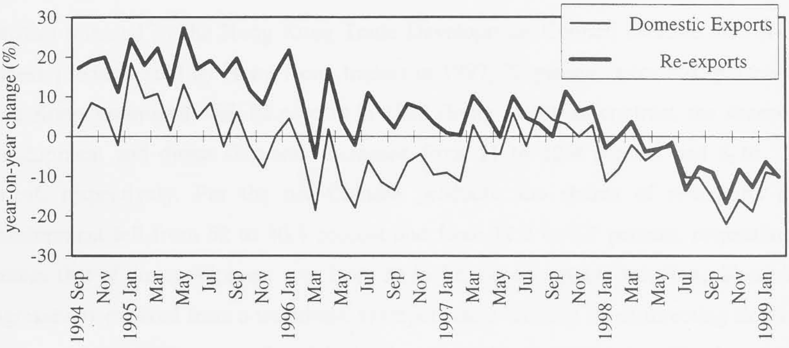
It can be seen that China utilizes Hong Kong more than either the US or the world as a whole. In 1993, the ratio of "China-to-US" dropped dramatically because of the reclassification of exports of China. Since then re-exports via Hong Kong to a third country (if traceable) have been counted as exports to that country instead of to Hong Kong, as they used to be (Fung and Lau 1999). The reclassification is a means to settle the disagreement between China and the US over the measurement of their trade balance.

Despite the reclassification, the ratio of "China-to-US" is still much larger than that of "China-to-World", implying that Chinese products utilize Hong Kong as a gateway to the US market more than to elsewhere. Similarly, the US makes use of Hong Kong as its trading port mainly for the Chinese market. Combining all the evidence, it can be inferred that the US-China-Hong Kong triangle constitutes the largest indirect trading bloc in the world.

5.2.5 Offshore Trade

Since the mid-1990s, there are signs that the growth of Hong Kong exports has been slowing down. As evidenced in Figure 5.7, throughout 1996 domestic exports even registered negative growth on a year-on-year basis. The tremble in export growth was due to a decline in global demand plus a strengthening of the US dollar. The latter propagated into a real appreciation of the Hong Kong dollar by over 12 percent from mid-1995 to end-1996 (Mihaljek, Hussain et al. 1998). Dodsworth and Mihaljek (1997) estimate that, for Hong Kong, a 1 percent rise in the real exchange rate leads to a 0.5 percent decline in export volume.

Figure 5.7: Year-on-year Growth Rate of Hong Kong Exports



Source: The Census and Statistics Department of the Hong Kong Government (http://www.info.gov.hk/censtatd/hkstat/fas/ttrade1.htm).

The dwindling in trade growth has intensified since the onset of the Asian crisis. This was only partly related to the disruption in the East Asian market, and more to weakening import demand in China. In the second half of 1998, the year-on-year growth rate of exports to China fell by 15.9 percent.

A feature of Figure 5.7 is that the two growth rates are highly synchronous. A hypothesis could be made that re-exports and domestic exports were subject to symmetric negative shocks, but that the former were better weathered than the latter. Notwithstanding, the performance of re-exports during this period was indeed more striking than it appeared when measured against the buoyant export growth of China. In the first half of 1997, China's exports grew by 26.2 percent on a year-on-year basis, whereas Hong Kong's re-exports only grew by 3 percent (Hang Seng Bank 1997).

In fact, the contrast in export growth between Hong Kong and China signals another structural change of Hong Kong trade, in that traditional re-exporting activities are gradually replaced by transshipment, and, further, by direct shipment. Transshipment is where goods are exported by one country to others via Hong Kong's ports, but without changing the legal possession of the goods from overseas exporters to Hong Kong traders. Direct shipment is commonly referred to as "offshore trade." The goods involved do not even pass through Hong Kong; the role of Hong Kong traders is to provide brokerage services between offshore producers and buyers. Over one third of trading companies in Hong Kong are now engaged in offshore trade; their major customers are Asian countries (Dodsworth and Mihaljek 1997).

Statistics released by the Hong Kong Trade Development Council indicate that of the Chinese products sold by Hong Kong traders in 1997, 72 percent were re-exported via Hong Kong, compared with 81 percent in 1992 (Sung 1998). In contrast, the shares of transshipment and direct shipment increased from 11 to 12.4 percent and 8 to 15.8 percent, respectively. For the non-Chinese products, the shares of re-exports and transshipment fell from 52 to 40.4 percent and from 12.2 to 7.7 percent, respectively, whereas that of direct shipment rose from 36 to 52 percent. In a word, Hong Kong has progressively evolved from a traditional entrepot into a "control room directing flows of goods and investment across the globe" (Hang Seng Bank 1997). As official statistics exclude transshipment and direct shipment from entrepot trade, Figure 5.7 actually understates the growth rate of re-export services.

This transformation is consistent with the changing comparative advantages between Hong Kong and China. On the one hand, Hong Kong is land and labor scarce. Although re-export requires much less factor resources than domestic export, up to a certain point it is also labor and land intensive, as both factors are used extensively for cargo terminal operation (Sung 1998).

On the other hand, due to rapid improvement in its own infrastructure, the reliance of China on Hong Kong's port facilitates has been reduced recently. During 1996-98, the average annual growth rate of traffic in the northern ports of Shanghai, Tianjin and Qingdao reached 30 percent (Hang Seng Bank 1997). In the south, the fastest growing Yantian port located in Shenzhen registered an upsurge of throughput by about 70 percent during 1996-97 (ibid.).

China has gradually abolished the preferential treatment granted to foreign investment in coastal areas. The policy is now preserved for less-developed inland provinces as a means to combat regional disparity (Hong Kong Bank 1997a). The benefits enjoyed by Hong Kong due to its close linkage to the Peal River Delta region is thus diluted.[5] The impact of this shift of development gravity in the mainland upon Hong Kong is reflected in the diminishing momentum of OPRT since the mid-1990s. In 1990, outward processing related total exports to and imports from China grew at annual rates of 19.7 and 27.9 percent, respectively (Sung 1998). By 1997, the growth rates had dropped to 10.0 and 8.3 percent, respectively (ibid.).

As a consequence, shifting resources from conventional entrepot trade to transshipment and offshore trade, in particular, can help maintain the competitiveness of Hong Kong as a trading center both in the bigger China and in the region.

5.2.6 Remarks

The recent structural shift in Hong Kong trade by no means undermines the importance of analyzing how the exchange rate regime interacts with entrepot trade.

First of all, despite signs of slowing down, Sung (1998) expects the indirect trade between China and Hong Kong to keep growing in absolute terms. The driving force behind this development is the continuous decentralization of the foreign trade system in China and the growth of Hong Kong investments in processing operations in China. To surf the wave of policy changes in the mainland, Hong Kong manufacturers have started relocating lower value-added production to inland provinces and freeing up the capacity in coastal provinces for a higher value-added one (Dodsworth and Mihaljek 1997).

Secondly, the lack of coordination in infrastructure development in the mainland hinders its ports from overtaking Hong Kong in the near future. As pointed out by Sung (1998), due to scale economies, a container port has to operate at or above the level of 1.5 million containers a year to make it efficient. This figure is 2.5 times the freight

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[5] For instance, the share of Guangdong province in China's exports increased rapidly from 10.2 percent in 1984 to a peak of 44 percent in 1994, but then slid back to 41.6 percent in 1997 (Sung 1998:14).

volume handled by Yantain in 1996,[6] 15 times the volume handled by Shekou – another container port in Shenzhen. As China has excessively expanded its container port capacity at one point, it has actually reduced the competitiveness of each port relative to Hong Kong. This is reflected in the fact that 93 percent of Guangdong's cargo in 1996 was still handled by Hong Kong (ibid.).

Furthermore, due to the significant economies of scale and economies of agglomeration in trading activities, being an established trading hub, Hong Kong will be in an advantageous position to compete with other late comers. Indeed, many Chinese companies have established subsidiaries in Hong Kong to handle their trade in order to take advantage of those scale economies (ibid.).

Last, as stated previously, the contraction in official re-export figures merely represents a reallocation of resources from traditional entrepot trade to *new* entrepot trade – transshipment and offshore trade. In 1997, in terms of re-exports, Hong Kong handled two-fifths of China's trade. But when transshipments, direct shipments, and direct trade with Hong Kong are included, the ratio rises to two-thirds (ibid.).

Considering all these factors, it can be concluded that, although the format of entrepot trade has been shifting, the prospect of Hong Kong as an international trading hub remains promising.

5.3 HISTORICAL PERSPECTIVE

For Hong Kong, choosing the anchor currency between the Chinese currency and the US dollar is not a new problem. About 125 years ago, Hong Kong was confronted with exactly the same problem! This section provides an historical perspective of the economic relationship between the US, China and Hong Kong during 1840-1950. The

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[6] In 1997, Yantain's capacity was merely about 0.6 million containers per year, compared to 13.5 million containers processed by Hong Kong in 1996. Notwithstanding, the potential capacity of Yantain is estimated at over 16 million containers a year. This indicates that there is a huge unexplored port capacity in the mainland.

choice of monetary standard for the Hong Kong dollar during that period will be emphasized.

When the United Kingdom (UK) colonized Hong Kong in 1842, its objective was to make Hong Kong its trading port in the Far East, primarily for China's market. As a result, commerce and entrepot trade activities bloomed rapidly in Hong Kong. Entrepot trade was the dominant activity, as there were virtually no domestic products exported.

The economic structure of Hong Kong started to change when the People's Republic of China was established in 1949. Internally, China was willing to trade only with the former Soviet Union Bloc. Foreign trade was completely centralized and conducted on a state-to-state basis without involving middlemen (Sung 1998). After diplomatic relations with the Soviet Union turned sour in the late 1950s, instead of developing economic ties with other countries, China retreated into a policy of self-sufficiency. Consequently, imports of consumer goods were heavily curtailed. The engagement of China in the Korean War in 1951 led to an export embargo on essentials and strategic goods to China by the United Nations, and an import embargo on Chinese products by the US. China's share of Hong Kong's total exports shrank from 39.3 percent in 1950 to 4.2 percent in 1956, and to less than 1 percent by 1966 (Ho 1992).

However, during the 100 years between the 1840s and the 1950s, China dominated the trade activities of Hong Kong. This intimate trade relationship created a dilemma for Hong Kong in the 1870s, when there was a big shift of monetary standards among a lot of countries.

In 1870, western countries started to abandon the bimetallism system and used only gold as their monetary standard. However, countries in the Far East, including China maintained the silver standard. This resulted in two currency areas in the world – the gold and silver standards – roughly corresponding geographically to the West and the East. In 1873, the value of silver relative to gold began to fall, and fluctuated widely throughout the following decade. The depreciation of silver promoted Chinese exports, and therefore Hong Kong trade (Nugee 1995). A number of eastern countries, including Japan, decided to switch to the gold standard. Nevertheless, China maintained the silver standard for another 60 years, until 1935. China abandoned the silver standard after the US heavily purchased silver in the international market and caused large silver outflows from China and Hong Kong. As a result, Hong Kong also left the silver standard.

Therefore, during 1873-1935, Hong Kong was confronted with the problem of choosing between the gold and silver standard. In contrast to the contemporary situation, Hong Kong chose to stay in the silver zone, thereby effectively pegging the Hong Kong dollar to the Chinese currency. During that period, the Hong Kong dollar fluctuated heavily against the currencies under the gold standard, including the pound sterling. Tom (1989) put forwards several reasons to justify why Hong Kong chose the silver instead of the gold standard; however some of his arguments are subject to scrutiny:

- *Relative size of trade*. At that time China was accounted for the majority of the trade activities in Hong Kong. During 1931-35, just before China abandoned the silver standard, about 70 percent of Hong Kong's trade was related to China. Tom suggests that if Hong Kong had adopted the gold standard, its trade with China would have decreased and that with other countries would have increased. Since the volume of the former was larger than the latter, Hong Kong was better off staying in the same monetary zone with China. Notwithstanding, a breakdown of the figure shows that re-exports of Chinese products to other countries accounted for 24.4 percent of total Hong Kong trade, the re-exports of other countries' products to China 38.4 percent, while intra-China trade accounted for only 6.7 percent (ibid.). So, in total, over 90 percent of trade involved other countries. If a clear majority of those countries adopted the gold standard, then silver and gold were of equal importance in the trade of Hong Kong. Therefore, Tom's argument may not be that solid.

- *Quoting currency*. At that time, while the prices of imports and exports traded with Britain were quoted in pound sterling, those traded with Guangdong were quoted in Hong Kong dollars. Tom argues that the silver standard helped strengthen Hong Kong's trade with Guangdong by eliminating the exchange risk faced by Guangdong merchants. This argument presumes that absorbing the exchange risk between the Hong Kong dollar and the pound sterling incurred no cost to Hong Kong merchants (it could be true given the next factor). Indeed, unless the two trading parties peg their currencies together, an entrepot can not expect to eliminate exchange rate risks on both sides.

- *Effectiveness of forward market.* During that period, a forward exchange market already existed between London and Hong Kong, but not between Guangdong and Hong Kong (ibid.). Since the exchange risks between the pound sterling and the Hong Kong dollar could be hedged in the forward market, it would be more beneficial for Hong Kong to maintain a stable exchange rate with China.

- *Familiarity with the anchor currency.* Silver was traditionally used as a monetary standard. Even if during the period of the pound sterling standard from 1844 to 1863, the enforcement of using it was not strong (ibid.). The familiarity of handling silver implied a cost of adjustment should Hong Kong switch to the gold standard.

Overall, despite Tom (1989) raising some relevant issues, a rigorous and consistent theoretical framework is not yet in shape. The mechanism involved is barely explained. As a result, some of the logic appears to be rather ad hoc. In view of this insufficiency, the next section introduces a mathematical three-country model to disentangle the interaction between entrepot trade and monetary standard. The analytical result of the model indicates that the nature of disturbances, the relative size of direct and indirect trade, and the shares of value-added in indirect trade, all have effects on the choice of monetary standard.

5.4 THREE COUNTRY INDIRECT TRADE MODEL

By and large the models in the literature of exchange rate regimes fall into two categories. The first is a two-country model, such as in Dornbusch (1980),[7] and the second is a multicountry model, such as the Multimod, MSG2, and MX3 models in Gagnon, Masson et al. (1996). Two country models restrict the choice of exchange rate regime for a small country between either a globally fixed or globally floating regime. Under such "all or nothing terms," a fixed regime will internalize all the disturbances from the big country (Kenen 1984). On the other hand, the complexity of multicountry

[7] Another class of "small open economy" model like the classic Mundell-Fleming-Dornbush model is indeed of a two-country setting in which one of the countries (i.e. the world) tends to infinitely large.

models makes them less appealing for theoretical studies. This paper uses a three-country model as a balance between the two extremes.

Three-country models are not that popular in the literature, possibly because they are still relatively complex. Thus, it is common to impose some simplifying assumptions onto the models. For example, Sedio (1971) uses a partial equilibrium three-country model to examine the balance-of-payments for Canada. Lane (1990) assumes purchasing power parity (PPP) in his study of strategic issues of exchange rate arrangements. As pointed out by Kenen (1984), imposing PPP onto a model precludes the effects of real exchange rate variations. Another common simplifying assumption is that one country is small, so that the activities of the two big countries are independent of the former, examples include Argy, McKibbin et al. (1989) and Son (1987).

The model used for this study is based on Argy, McKibbin et al. (1989), which is a precise refinement of Marston (1984). The model is a static, three-country model. It consists of two big countries *B* and *C*, and one small entrepot *A*. There are two markets in each country: goods and money markets. This study focuses only on the short run scenario. This is because the model possesses money neutrality, so in the long run, when prices and wages are fully flexible, exchange rate regimes are irrelevant to the outcome. Furthermore, in this model trade structures have effects on the results when there are real exchange rate movements. A plausible and simple way to introduce such movements is to fix the prices, such that PPP does not hold. Most importantly, to allow simulation experiments to be conducted the trade structure has to be exogenous. In a longer time horizon, it will be more appropriate to treat trade structure as endogenous.

Countries are linked by trade and capital flows, domestic agents hold only foreign bonds but no foreign currencies. Capital is perfectly mobile internationally, so real interest rates are equalized across all the countries by arbitrage. As wages are fixed in the short run, labor markets are omitted. Thus, supplies are perfectly elastic, and outputs are completely demand determined. Every country produces one distinct good, for all the purposes of domestic consumption, direct exports and indirect exports. There are a total of eight routes of trade: six routes of direct trade between the three countries and two routes of indirect trade between *B* and *C* via *A*. Overall, the model has a strong flavor of the Mundell-Fleming model.

The notations of the model are listed in Appendix 5. Nominal exchange rates are defined in the way that e_b^a is $A\$$ per $B\$$; that is, if e_b^a increases, $A\$$ is depreciating against $B\$$. θ_j's are exogenously determined trade structure parameters. If θ_1 increases, the exports of A to B are increasingly dominated by direct exports, and so forth. Indirect exports are composed of the outputs of both the source country and the entrepot. For example, if θ_5 increases, the value-added of A increases relative to that of C in their indirect exports to B.

5.4.1 Goods Market

The aggregate demand equations are derived from a simple utility maximization process. For example, the utility maximization problem confronted by a representative agent i in A is given by:

$$\text{maximize } U_i^a(C_i^a, C_i^b, C_i^c) = (C_i^a)^{\sigma_1}(C_i^b)^{\sigma_2}(C_i^c)^{\sigma_3} \text{ subject to}$$

$$(1-s_i)P^aY_i^a = P^aC_i^a + P^be_b^aC_i^b + P^ce_c^aC_i^c.$$

C_i^a, C_i^b and C_i^b are the consumption of the domestic products and the imported goods from B and C, respectively; $(\sigma_1+\sigma_2+\sigma_3) \in (0, 1)$; and s_i is the saving rate. The utility function is of the Cobb-Douglas form. Labor supply is not incorporated into the consumption decision making process as the nominal wage is fixed in the short run. It is assumed that no transaction cost of trade arises from differences in monetary standard.[8]

The maximization problem confronted by a representative agent j in B is given by:

$$\text{maximize } U_j^b(C_j^b, C_j^c, C_j^{ac}) = (C_j^b)^{\sigma_4}(C_j^c)^{\sigma_5}(C_j^{ac})^{\sigma_6} \text{ subject to}$$

$$(1-s_j)P^bY_j^b = P^bC_j^b + P^ce_c^bC_j^c + [(1-\theta_6)(P^be_c^b) + \theta_6(P^ae_a^b)]C_j^{ac}.$$

The expression for the agent j in B is different from that in A in two aspects. Firstly, as B and C are big countries, following Argy, McKibbin et al. (1989), the direct exports of

A are assumed to be negligible in the consumption of the agent in B. Secondly, besides the domestic outputs and the direct exports from C, the agent also consumes the indirect exports from C, C_j^{ac}. The price of indirect exports is equal to the sum of the prices of manufactured output and trading services, respectively, weighted by their shares of value-added in the indirect exports.

Individual demand equations will be obtained by solving all the maximization problems. The demand equations can be further aggregated and transformed into linear logarithm forms for small changes:

$$y_d^a = \Omega y^a - \lambda r + \mu^a + \kappa_1[\Omega y^b - \eta(p^a - e_b^a - p^b)] + \kappa_2[\Omega y^c - \eta(p^a - e_c^a - p^c)]$$

$$+(1-\kappa_1)\{\Omega y^b + \eta[(1-\theta_6)(p^b - e_c^b - p^c) - \theta_6(p^a - e_b^a - p^b)]\}$$

$$+(1-\kappa_2)\{\Omega y^c - \eta[(1-\theta_5)(p^b - e_c^b - p^c) + \theta_5(p^a - e_c^a - p^c)]\} \qquad (5.1a)$$

$$y_d^b = \Omega y^b - \lambda r + \mu^b + \kappa_3[\Omega y^c - \eta(p^b - e_c^b - p^c)]$$

$$+(1-\kappa_3)\{\Omega y^c - \eta[(1-\theta_5)(p^b - e_c^b - p^c) + \theta_5(p^a - e_c^a - p^c)]\} \qquad (5.1b)$$

$$y_d^c = \Omega y^c - \lambda r + \mu^c + \kappa_4[\Omega y^b + \eta(p^b - e_c^b - p^c)]$$

$$+(1-\kappa_4)\{\Omega y^b + \eta[(1-\theta_6)(p^b - e_c^b - p^c) - \theta_6(p^a - e_b^a - p^b)]\}. \qquad (5.1c)$$

For simplicity, the income elasticities of all the countries are set to be the same, and so are the price and interest elasticities, respectively.

All the items weighted by $(1-\kappa_i)$'s are indirect export items; for example, the last two terms in equation (5.1a) are the re-exports of A to B and C, respectively. All the items weighted by κ_i's are direct export items; for example, $\kappa_1[\Omega y^b - \eta(p^a - e_b^a - p^b)]$ is the direct export of A to B. κ_i's are constructed in such a way to guarantee that, all the countries are trading with each other for any values of θ_i within the range of [0,1]. For

[8] It contrasts to a common "iceberg" specification in the literature of monetary unification, for example, Ricci (1997) and Bayoumi (1994).

instance, if the size of the indirect export sector of *B* contracts, its direct export sector will expand correspondingly. The value-added of direct exports is assumed to be 100 percent. This setting is indeed to maintain a constant base for the export sector of each country and essential to comparing the outcomes under different trade structures.

It should be noted that every trade structure parameter attaches to a real exchange rate term. Hence it gives the real exchange rate a crucial role in driving the result in that the influence of trade structure on the impact of a disturbance will come with, and only with, real exchange rate movements.

Assuming goods markets clear, and using composite parameters (defined in Appendix 5), (5.1a)-(5.1b) can be rewritten as:

$$y^a = -\alpha_1 r + \alpha_2 \mu^a + \alpha_3 (y^b + y^c) - \alpha_4 (p^a - e_b^a - p^b) - \alpha_5 (p^b - e_c^b - p^c) \qquad (5.2a)$$

$$y^b = -\alpha_1 r + \alpha_2 \mu^b + \alpha_3 y^c \qquad - \beta_4 (p^a - e_b^a - p^b) - \beta_5 (p^b - e_c^b - p^c) \qquad (5.2b)$$

$$y^c = -\alpha_1 r + \alpha_2 \mu^c + \alpha_3 y^b \qquad - \varepsilon_4 (p^a - e_b^a - p^b) + \varepsilon_5 (p^b - e_c^b - p^c) \qquad (5.2c)$$

5.4.2 Money Market

Money markets are of 'standard' specifications, including continuous market clearing:

$$m^a = y^a - \phi r + p^a + \pi^a \qquad (5.3a)$$

$$m^b = y^b - \phi r + p^b + \pi^b \qquad (5.3b)$$

$$m^c = y^c - \phi r + p^c + \pi^c . \qquad (5.3c)$$

To simplify the model, the income elasticities of money demand are set to one. It implies the velocities of money to be constant. Moreover, domestic output prices rather than consumer price indexes are used in the money demand functions for simplicity.

5.5 ANALYTICAL RESULTS

There are a number of possible combinations of exchange rate regimes between the three countries. The objective of this study is to assess how trade structure affects the choice of nominal anchor should the entrepot decide to adopt a fixed exchange rate regime. If *B$* and *C$* are pegged together, pegging *A$* to either one of them will be equivalent. Obviously, the most relevant case is that *B$* and *C$* are floating *vis-à-vis* each other and *A$* is pegged to either one of them. The result for this case is summarized in Table 5.3.

Table 5.3: Impacts on the Output of Entrepot *A*

Regime	μ^a	μ^b	μ^c	π^a	π^b	π^c
A$* pegs to *B$	+	?	(+)	0	(–)	?
$dX/d\theta_1$	0	–	+	0	–	+
$dX/d\theta_4$	0	(+)	(–)	0	(+)	(–)
$dX/d\theta_6$	0	?	?	0	?	?
A$* pegs to *C$	+	(+)	?	0	?	(–)
$dX/d\theta_2$	0	+	–	0	+	–
$dX/d\theta_3$	0	(–)	(+)	0	(–)	(+)
$dX/d\theta_5$	0	?	?	0	?	?
(peg to *B$* – peg to *C$*)^2	0	(+)	(–)	0	(+)	(–)
$dV/d\theta_1$ or $dV/d\theta_2$	0	(+)	(+)	0	(+)	(+)
$dV/d\theta_3$ or $dV/d\theta_4$	0	(–)	(–)	0	(–)	(–)
$dV/d\theta_5$ or $dV/d\theta_6$	0	?	?	0	?	?

(a) $X = dy^a/d(shock)$; V = variance of X between pegging *A$* to *B$* and to *C$*, respectively. A question mark indicates that the sign of result is ambiguous; and a bracket indicates that the sign is very likely but not absolutely to be the one in the bracket.

In Table 5.3, "*X*" denotes the impact of the corresponding shock on the output of the entrepot. For example, in the first column, X is equal to $dy^a/d\mu^a$, and "$dX/d\theta_j$" denotes the influence of the trade structure parameter θ_j on the impact. The last four rows refer to the opportunity cost between pegging to *C$* and *B$*, respectively. "*V*" stands for the variance of X between the two regimes. A question mark indicates that the sign of the result is ambiguous; a bracket indicates that the sign of the result is very likely but not absolutely to be the one in the bracket, depending on whether the values of the parameters are 'moderate.'

Note that when *A$* is pegged to *B$*, θ_2, θ_3, and θ_5 have no effects on the impacts of shocks, and so are θ_1, θ_4, and θ_6 when *A$* is pegged to *C$*. The first three parameters determine the trade structure between *A* and *B*, while the last three determine the structure between *A* and *C*. When *A$* is pegged to *B$*, the exchange rates of *A$* and *B$* *vis-à-vis C$* move at the same proportion. As a result the price movements of the direct exports and re-exports of *A* to *C* are perfectly synchronized, rendering the relative size between them and, hence, the trade structure parameters between *A* and *B* irrelevant.

The results for the two fixed exchange rate regimes are like mirror images. This is because, as there are only three countries, a shock from *B* under the currency area of *B$* is qualitatively equivalent to a shock from *C* under the currency area of *C$*, and so forth. Therefore, the next two subsections discuss the results for the currency area of *B$* only. Furthermore, Table 5.3 only reports the results of expansionary real demand shocks and contractionary nominal shocks. The results for contractionary real demand and expansionary nominal shocks are simply the reverse of their counterparts, and so are skipped.

The solution for the output of *A*, y^a, under the currency area of *B$* is given by:

$$
\begin{aligned}
y^a &= \alpha_2\mu^a \\
&+\alpha_2(\alpha_6\varepsilon_5-\alpha_5)(\beta_5+\varepsilon_5)^{-1}\mu^b \\
&+\alpha_2(\alpha_6\varepsilon_5+\alpha_5)(\beta_5+\varepsilon_5)^{-1}\mu^c \\
&+[\alpha_6(\varepsilon_5-\alpha_3\beta_5)-\alpha_3(\beta_5+\varepsilon_5)-\alpha_5(1+\alpha_3)](\beta_5+\varepsilon_5)^{-1}\pi^b \\
&+[\alpha_6(\varepsilon_5-\alpha_3\beta_5)-\alpha_3(\beta_5+\varepsilon_5)+\alpha_5(1+\alpha_3)](\beta_5+\varepsilon_5)^{-1}\pi^c.
\end{aligned}
$$

The impacts of shocks from *B* and *C*, respectively, on *A* are fairly symmetric, except for the terms involving α_5. This indicates that the key difference between the impacts of the two sources of shocks relies on indirect trade. Given the symmetric set up of various elasticities, the shocks from the anchor country *B* have smaller expansionary effects on the output of *A* than their counterparts from *C*.

5.5.1 Domestic Shocks from *A*

A nominal shock from *A*, π^a, has no real impact, simply because *A$* is pegged to *B$*. The domestic impact of a real shock from *A*, μ^a, is given by:

$$dy^a / d\mu^a = (1-\Omega)^{-1}.$$

This is a typical short run result for a small economy under the Mundell-Fleming model. The result is independent of the choice of the nominal anchor as well as trade structure, since all items of $dX / d\theta_j$ are equal to zero. This is because shocks from the small country do not affect the nominal exchange rate between the two big countries. When *A$* is pegged either to *B$* or to *C$*, the nominal exchange rate of *A* is also fixed. Additionally, in the short run, prices are rigid. Consequently, there are no real exchange rate movements at all. Since the effects of changes in trade structure come from real exchange rate movements, in this case the trade structure ceases to have any effects on the results.

5.5.2 Expansionary Real Demand Shock from *B*

The domestic impact of an expansionary real demand shock from *B*, μ^b, is given by:

$$dy^a / d\mu^b = X_1 = \alpha_2(\alpha_6\varepsilon_5 - \alpha_5)(\varepsilon_5 + \beta_5)^{-1}.$$

Strictly speaking, the sign of $dy^a/d\mu^b$ is ambiguous. On the one side, the larger incomes in *B* and *C* bring about a higher demand for the direct exports of *A*. Offsetting this is a higher world interest rate. Regarding the entrepot trade, the appreciation of *B$* and *A$* *vis-à-vis C$* raises the indirect exports of *C* to *B*, but reduces those in the opposite direction. Overall, $dy^a/d\mu^b$ is likely to be positive. It, in turn, requires α_6 and, in this case, $\alpha_6\,\varepsilon_5$ - α_5, to be positive. The positive condition on α_6 is assumed to hold for the rest of the paper.

To examine how trade structure influences the results, X_1 is differentiated with respect to trade structure parameters:

$$dX_1 / d\theta_1 = -\alpha_2(1-\theta_6)(2+\kappa_4\theta_6-\theta_6)^{-1}(d\kappa_1 / d\theta_1) < 0 \tag{5.4a}$$

$$dX_1 / d\theta_4 = \alpha_2\theta_6[\alpha_6+(\kappa_1+\theta_6-\kappa_1\theta_6)](2+\kappa_4\theta_6-\theta_6)^{-2}(d\kappa_4 / d\theta_4) > 0 \tag{5.4b}$$

$$dX_1 / d\theta_6 = \alpha_2(2+\kappa_4\theta_6-\theta_6)^{-2}\{[\alpha_6(\kappa_4-1)+\kappa_1(1+\kappa_4)-2]$$

$$-(1-\theta_6)(2+\kappa_4\theta_6-\theta_6)(d\kappa_1 / d\theta_6)+\theta_6[\alpha_6+(\kappa_1+\theta_6-\kappa_1\theta_6)](d\kappa_4 / d\theta_6)\} >< 0 \tag{5.4c}$$

where:

$$d\kappa_1 / d\theta_1 = \theta_6[\theta_1+(1-\theta_1)\theta_6]^{-2} > 0$$

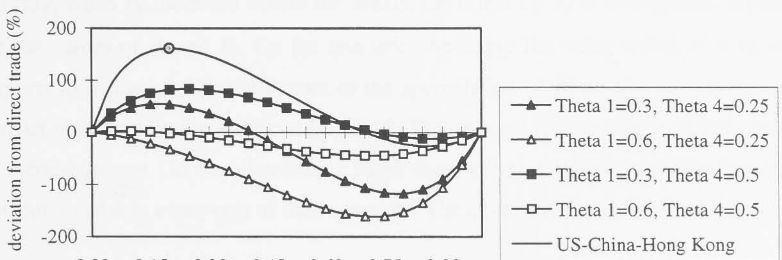
$$d\kappa_1 / d\theta_6 = -\theta_1(1-\theta_1)[\theta_1+\theta_6(1-\theta_1)]^{-2} < 0$$

$$d\kappa_4 / d\theta_4 = (1-\theta_6)[1-\theta_6(1-\theta_4)]^{-2} > 0$$

$$d\kappa_4 / d\theta_6 = \theta_4(1-\theta_4)[1-\theta_6(1-\theta_4)]^{-2} > 0.$$

It is worthwhile to point out that the sign of $dX_1/d\theta_1$ does not depend on the assumption upon α_6. Figure 5.8 provides a graphical illustration of equations (5.4a)-(5.4c).

Figure 5.8: Effect of Trade Structure on the Impacts of an Expansionary Real Demand Shock from *B*



The figure is a plot of the percentage deviation of X_1 from the benchmark case of purely direct trade. In the figure, the value of α_6 is set to be 1.2, which gives $dy^a/d\mu^b$ a positive sign. The four curves correspond to different values of θ_1 and θ_4; "Theta 1" stands for θ_1

and so forth. At the two ends of the curves, θ_6 is equal to 0 and 1, respectively, resembling the benchmark case.

When θ_1 increases from 0.3 to 0.6, while keeping the value of θ_4 constant, the value of X_1 falls (i.e. from black lines to white lines). It implies that an increase in the share of gross output of the direct exports in the total exports of *A* to *B* unambiguously dampens the impact of the real shock on *A*'s output. As *B$* appreciates against *C$*, the demand of *B* for the exports of *C* increases, leading to a higher demand for the trade services of *A*. If the re-exports to *B* make up a smaller proportion in the total exports of *A* to *B*, the pressure on the trade service of *A* will be correspondingly lower.

Secondly, when θ_4 increases, X_2 rises (i.e. from triangular lines to rectangular lines). It means that an increase in the share of gross output of the direct exports in the total exports of *C* to *B* will amplify the impact on *A*. At first glance this appears to contradict the previous result, in the sense that a larger share of direct exports in the total exports of *C* should lower the demand for the trade services of *A*. The positive result is due to the income effects of *C*. Since the price of the indirect exports of *C* are composed of the output prices of *A* and *C*, the impact of the appreciation of *B$* on the indirect exports of *C* is less than on its direct exports. Therefore, the larger the share of direct exports in the total exports of *C* to *B*, the larger the rise of income in *C* which, in turn, increases the demand of *C* itself for the direct exports and re-exports of *A*.

Thirdly, when θ_6 increases across the x-axis, the effect on X_1 is ambiguous, depending on the values of θ_1 and θ_4. On the one side, the larger the value-added of *A* in its re-exports to *B*, the smaller the impact of the appreciation of *B$* on the re-exports, as the impact is diluted by the appreciation of *A$*. The demand for the output of *A* is retarded as a consequence. On the other side, a larger share of value-added raises the demand for the output of *A* in every unit of the re-exports. Thus, the overall result is ambiguous.

For the curve "US-China-Hong Kong", some approximating figures are used to resemble the structure of the indirect trading bloc in that θ_1 is equal to 0.15, θ_4 equal to

0.4, and θ_6 equal to 0.20 at the circular point.[9] It can be seen that, at the circular point, the impact is amplified by over 150 percent! The result is largely ascribed to the fact that the gross value of the indirect exports of Hong Kong is much larger that its direct exports, that is, θ_1 is small.

This reveals that the trade structure of Hong Kong could be quite ineffective in sheltering its output from the real demand shocks from the anchor country – the US. Obviously, the result is conditional on the values of various elasticities as well as the accuracy of the model in representing the economies. Nevertheless, it clearly demonstrates the neglected role of indirect trade in the consideration of exchange rate regimes can actually be very substantial.

5.5.3 Expansionary Real Demand Shock from *C*

$$dy^a / d\mu^c = X_2 = \alpha_2(\alpha_6\beta_5 + \alpha_5)(\varepsilon_5 + \beta_5)^{-1}$$

$$dX_2 / d\theta_1 = \alpha_2(1-\theta_6)(2+\kappa_4\theta_6 - \theta_6)^{-1}(d\kappa_1 / d\theta_1) > 0$$

$$dX_2 / d\theta_4 = -\alpha_2\theta_6[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](2+\kappa_4\theta_6 - \theta_6)^{-2}(d\kappa_4 / d\theta_4) < 0$$

$$dX_2 / d\theta_6 = -\alpha_2(2+\kappa_4\theta_6 - \theta_6)^{-2}\{[\alpha_6(\kappa_4 - 1) + \kappa_1(1+\kappa_4) - 2]$$

$$-(1-\theta_6)(2+\kappa_4\theta_6 - \theta_6)(d\kappa_1 / d\theta_6) + \theta_6[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](d\kappa_6 / d\theta_6)\} >< 0.$$

The value of $dy^a/d\mu^c$ is unambiguously larger than $dy^a/d\mu^b$ by $2\alpha_2\alpha_5(\varepsilon_5+\beta_5)^{-1}$. This is because as *A$* is pegged to *B$*, an expansionary real demand shock from *C* will incur depreciating pressure on *A$*. Both the income and substitution effects work at the same direction to raise the output of *A*. The signs of the derivatives of $dy^a/d\mu^c$ are the opposite to those of $dy^a/d\mu^b$, and so are the explanations.

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[9] Despite the re-export margins of Chinese goods and goods of other origins being quite different, a figure close to the average margin is used here for simplicity.

5.5.4 Contractionary Nominal Shock from *B*

$$dy^a / d\pi^b = X_3 = [\alpha_6(\varepsilon_5 - \alpha_3\beta_5) - (\varepsilon_5 + \beta_5)\alpha_3 - (1+\alpha_3)\alpha_5](\varepsilon_5 + \beta_5)^{-1}$$

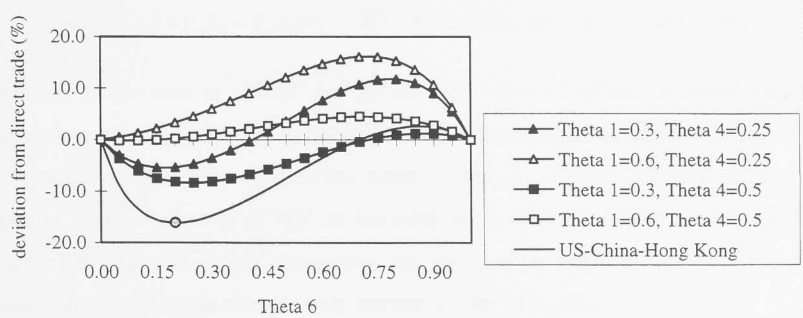
$$dX_3 / d\theta_1 = -(1+\alpha_3)(1-\theta_6)(2+\kappa_4\theta_6 - \theta_6)^{-1}(d\kappa_1 / d\theta_1) < 0 \qquad (5.5a)$$

$$dX_3 / d\theta_4 = \theta_6(1+\alpha_3)[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](2+\kappa_4\theta_6 - \theta_6)^{-2}(d\kappa_4 / d\theta_4) > 0 \qquad (5.5b)$$

$$dX_3 / d\theta_6 = (1+\alpha_3)(2+\kappa_4\theta_6 - \theta_6)^{-2}\{[\alpha_6(\kappa_4 - 1) + \kappa_1(1+\kappa_4) - 2]$$
$$-(1-\theta_6)(2+\kappa_4\theta_6 - \theta_6)(d\kappa_1 / d\theta_6) + \theta_6[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](d\kappa_4 / d\theta_6)\} >< 0. \qquad (5.5c)$$

Strictly speaking, the sign of $dy^a/d\pi^b$ is ambiguous. On the one hand, the exports of *A* and *B* to *C* are suppressed by the appreciation of their currencies. Along with this is a higher world interest rate. On the other hand, a higher income in *C* increases the demand for the exports of *A*. Overall, $dy^a/d\pi^b$ is more likely to be negative. Figure 5.9 provides a graphical illustration of equations (5.5a)-(5.5c).

Figure 5.9: Effect of Trade Structure on the Impacts of a Contractionary Nominal Shock from *B*



The signs of the derivatives are the same as those of $dy^a/d\mu^b$. This is because, for both the expansionary real demand shock and contractionary nominal shock, *B$* and *A$* appreciate against *C$*. So, the directions of the movements of real exchange rates and, hence, the signs of the derivatives are the same. However, it does not mean that the effects of trade structure on the impacts are the same in both cases. This is because the value of $dy^a/d\pi^b$ is likely to be negative, so a positive derivative actually implies that the impact of the nominal shock is mitigated rather than augmented. That is why Figure 5.9 looks like a mirror image of Figure 5.8.In Figure 5.9, the changes of the trade parameters are the same as Figure 5.8. Setting α_6 to 1.2 gives $dy^a/d\pi^b$ a negative sign. Therefore, a larger value of θ_1 amplifies the impact, whereas a larger value of θ_4 tempers it. Again, the effect of a change in θ_6 is ambiguous. In contrast to the case of real demand shocks, the trade structure of the US-China-Hong Kong trade triangle is actually effective in weathering the output of Hong Kong from the anchor country's nominal shocks, even if the percentage change is much smaller than in Figure 5.8.

5.5.5 Contractionary Nominal Shock from *C*

$$dy^a / d\pi^c = X_4 = [\alpha_6(\beta_5 - \alpha_3\varepsilon_5) - (\varepsilon_5 + \beta_5)\alpha_3 + (1+\alpha_3)\alpha_5](\varepsilon_5 + \beta_5)^{-1}$$

$$dX_4 / d\theta_1 = (1+\alpha_3)(1-\theta_6)(2+\kappa_4\theta_6 - \theta_6)^{-1}(d\kappa_1 / d\theta_1) < 0$$

$$dX_4 / d\theta_4 = -\theta_6(1+\alpha_3)[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](2+\kappa_4\theta_6 - \theta_6)^{-2}(d\kappa_4 / d\theta_4) > 0$$

$$dX_4 / d\theta_6 = -(1+\alpha_3)(2+\kappa_4\theta_6 - \theta_6)^{-2}\{[\alpha_6(\kappa_4 - 1) + \kappa_1(1+\kappa_4) - 2]$$

$$-(1-\theta_6)(2+\kappa_4\theta_6 - \theta_6)(d\kappa_1 / d\theta_6) + \theta_6[\alpha_6 + (\kappa_1 + \theta_6 - \kappa_1\theta_6)](d\kappa_4 / d\theta_6)\} >< 0.$$

Similarly to the case of $dy^a/d\mu^b$ and $dy^a/d\mu^c$, the value of $dy^a/d\pi^c$ is unambiguously larger than $dy^a/d\pi^b$ by $2\alpha_5(1+\alpha_3)(\varepsilon_5+\beta_5)^{-1}$. This is because the substitution effect on *A* is stronger when *C\$* appreciates than when its anchor currency *B\$* does. Again, the signs of the derivatives of $dy^a/d\pi^c$ are the same as those of $dy^a/d\mu^c$. However, since the signs of $dy^a/d\pi^c$ and $dy^a/d\mu^c$ themselves are likely to be opposite, the trade structure parameters have reverse effects on the impacts for the two cases.

5.5.6 Opportunity Cost of Choosing The Nominal Anchor

The previous few subsections examine the net cost for *A* to peg its currency to *B\$* under various shocks. Nevertheless, inasmuch as the choice of the nominal anchor is concerned, it is the opportunity cost rather than the absolute cost that matters. The variance of the impacts between pegging to *B$* and *C$*, respectively, is used as an estimation of the opportunity cost. For a real shock from *B*, the variance of impacts is given as follows:

$$V_1 = (X_1 - X_1^*)^2 = [(dy^a / d\mu^b)_{B\$} - (dy^a / d\mu^b)_{C\$}]^2 .$$

Solutions for the impacts under the currency area of *C$* can be easily obtained by switching the parameters between *B* and *C*. For example, by knowing that

$$(dy^a / d\mu^b)_{B\$} = X_1 = \alpha_2(\alpha_6\varepsilon_5 - \alpha_5)(\beta_5 + \varepsilon_5)^{-1}$$

$$(dy^a / d\mu^c)_{B\$} = X_2 = \alpha_2(\alpha_6\varepsilon_5 + \alpha_5)(\beta_5 + \varepsilon_5)^{-1},$$

it can be deduced that:

$$(dy^a / d\mu^b)_{C\$} = X_1^* = \alpha_2(\alpha_6\varepsilon_5^* - \alpha_5^*)(\beta_5 + \varepsilon_5^*)^{-1}.$$

Since $V_1 = (X_1 - X_1^*)^2$, the derivative of V_1 with respect to θ_1 is given by:

$$dV_1 / d\theta_1 = 2(X_1 - X_1^*)(dX_1 / d\theta_1).$$

It is easy to prove that:

$$X_1 - X_1^* = \alpha_2[(2 + \kappa_4\theta_6 - \theta_6)(2 + \kappa_3\theta_5 - \theta_5)]^{-1}\{[(1-\kappa_3)\theta_5 - (1-\kappa_4)\theta_6]$$

$$-(\kappa_1 + \theta_6 - \kappa_1\theta_6)(2 + \kappa_3\theta_5 - \theta_5) - (\kappa_2 + \theta_5 - \kappa_2\theta_5)(2 + \kappa_4\theta_6 - \theta_6)\}.$$

Strictly speaking, the sign of $X_1 - X_1^*$ is ambiguous. However, if $\kappa_3 \approx \kappa_4$, and $\theta_5 \approx \theta_6$, then $[(1-\kappa_3)\theta_5 - (1-\kappa_4)\theta_6]$ is approximately equal to zero, and the sign of $X_1 - X_1^*$ is very likely to be negative. In terms of composite parameters:

$$X_1 - X_1^* \approx -\alpha_2[\alpha_5(\beta_5 + \varepsilon_5)^{-1} - \alpha_5^*(\beta_5 + \varepsilon_5^*)^{-1}] < 0. \tag{5.6a}$$

That is, for a real demand shock from *B*, pegging *A$* to *C$* has a greater expansionary effect than pegging to *B$*. The result actually echoes the difference between $dy^a/d\mu^c$ and $dy^a/d\mu^b$ under the currency area of *B$*.

As it is already known that the sign of $dX_1/d\theta_1$ is negative, it can be stated that:

$$dV_1 / d\theta_1 = 2(X_1 - X_1^*)(dX_1 / d\theta_1) > 0.$$

In a similar way, it can written down that:

$$dV_1 / d\theta_2 = 2(X_1^* - X_1)(dX_1^* / d\theta_2) > 0.$$

$$dV_1 / d\theta_3 = 2(X_1^* - X_1)(dX_1^* / d\theta_3) < 0$$

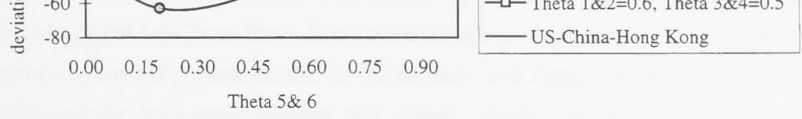
$$dV_1 / d\theta_4 = 2(X_1 - X_1^*)(dX_1 / d\theta_4) < 0$$

$$dV_1 / d\theta_5 = 2(X_1^* - X_1)(dX_1^* / d\theta_5) >< 0$$

$$dV_1 / d\theta_6 = 2(X_1 - X_1^*)(dX_1 / d\theta_6) >< 0.$$

To visualize the impacts of trade structure on the opportunity cost, the percentage deviations of V_1 from the benchmark case of purely direct trade are plotted in Figure 5.10. For simplicity, θ_1 is set to be equal to θ_2, θ_3 equal to θ_4, θ_5 equal to θ_6, and α_2 equal to 1.5; the figures on the x-axis are θ_5 and θ_6.

Figure 5.10: Variance Between Pegging *A$* to *B$* and to *C$* for an Expansionary Real Demand Shocks from *B*



An increase in θ_1 and θ_2 raises the deviations dramatically, especially when θ_5 and θ_6 are small. Secondly, as θ_3 and θ_4 increase, the deviations are reduced. Lastly, the effects of changes in θ_5 and θ_6 are ambiguous. Overall, the smaller the opportunity cost of choosing the anchor currency, the larger the shares of indirect exports in the total exports of A to B and C and the shares of the direct exports of B and C in their total exports. At the circular point of the curve "US-China-Hong Kong", the opportunity cost is reduced by about 60 percent. The outcome is mainly attributed to the fact that the trade sector of Hong Kong is predominately occupied by re-export activities.

Similarly, the square of the variance of impacts for a monetary shock from B is given by:

$$V_2 = [(dy^a / d\pi^b)_{B\$} - (dy^a / d\pi^b)_{C\$}]^2.$$

Again, by assuming $\kappa_3 \approx \kappa_4$, and $\theta_5 \approx \theta_6$, it can be written down that

$$X_3 - X_3^* \approx -(1+\alpha_3)[\alpha_5(\beta_5+\varepsilon_5)^{-1} + \alpha_5^*(\beta_5+\varepsilon_5^*)^{-1}] < 0 \tag{5.6b}$$

$$dV_2 / d\theta_1 = 2(X_3 - X_3^*)(dX_3 / d\theta_1) > 0$$

$$dV_2 / d\theta_2 = 2(X_3^* - X_3)(dX_3^* / d\theta_2) > 0$$

$$dV_2 / d\theta_3 = 2(X_3^* - X_3)(dX_3^* / d\theta_3) < 0$$

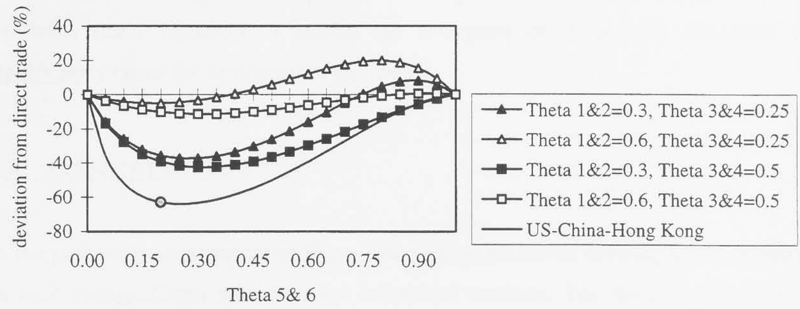
$$dV_2 / d\theta_4 = 2(X_3 - X_3^*)(dX_3 / d\theta_4) < 0$$

$$dV_2 / d\theta_5 = 2(X_3^* - X_3)(dX_3^* / d\theta_5) >< 0$$

$$dV_2 / d\theta_6 = 2(X_3 - X_3^*)(dX_3 / d\theta_6) >< 0.$$

Comparing equations (5.6a) and (5.6b) it can be seen that the trade structure parameters have almost the same impacts on V_1 and V_2, provided that the approximations are valid. A plot of V_2 is shown in Figure 5.11. In the figure α_3 is set to 1. Again, the trade structure of the US-China-Hong Kong trade triangle is quite effective in lowering the opportunity cost. Furthermore, the above findings, and Figures 5.10 and 5.11 remain unchanged for both contractionary real demand shocks and expansionary nominal shocks.

Figure 5.11: Variance Between Pegging *A\$* to *B\$* and to *C\$* for a Contraction Nominal Shock from *B*



Overall the results seem to suggest that the opportunity cost for the entrepot to choose the nominal anchor is significantly reduced as far as the short run impacts of demand shocks are concerned. Nevertheless, it does not mean that the entrepot is definitely better off by conducting indirect trade. This is because the smaller variances of impacts between the currency areas are achieved by magnifying the impacts under one regime and reducing those under the other. For example, if the real demand shocks from *B* dominate those from *C*, and *A\$* is pegged to *B\$*, then *A* will be better off if it exports to *B* directly only. In other words, while indirect trade reduces the opportunity cost of choosing the nominal anchor, it may also increase the net cost of fixing the domestic currency if the entrepot chooses the regime that actually incurs a lower cost under purely direct trade.

5.5.7 Other Scenarios

If *A\$* is pegged to a basket of *B\$* and *C\$*, it is actually to maintain an effective exchange rate of *A\$* constant. The outcome is merely a weighted sum of the results for the two fixed exchange rate regimes, respectively. It is known that the signs of the derivatives with respect to various trade structure parameters under the two regimes are just opposite. So, *ceteris paribus*, the net outcome depends on the relative weighting of the two currencies in the basket.

If *A\$* is floating, no matter whether *B\$* and *C\$* are floating or pegged together, the impacts of both foreign and domestic shocks on A as well as the influences of trade structure on the impacts become ambiguous. This is because, as the exchange rate of A is flexible, the changes of the prices of re-exports involve the movements of two exchange rates. Therefore it affects the re-exports of A in both directions and significantly raises the ambiguity of the results.

5.6 CONCLUSIONS

In the past the trade structure of Hong Kong has experienced several major transitions. In each change China was the most influential attribute. The development of Hong Kong as an entrepot in the nineteenth century was induced by the attractiveness of the Chinese market to western merchants. The disappearance of entrepot trade and the development of domestic exports in the mid-twentieth century was a consequence of China's isolation on the international political stage. The resurrection of Hong Kong as an entrepot in the late twentieth century was triggered by the opening up of the Chinese economy. The rapid growth of entrepot trade in Hong Kong is clearly a result of division of labor with the Chinese hinterland, adherent to the law of comparative advantages.

The increasingly close trade tie between Hong Kong and China inevitably raises the question of whether it makes better economic sense to peg the Hong Kong dollar with the renminbi instead of with the US dollar. The analysis of this chapter, while not contending which currency zone is more preferable, clearly points out that the distinct trade structure of Hong Kong renders the choice of the nominal anchor a less crucial issue, as far as trade is concerned. The following factors lead to such a conclusion.

As noted above, China has become an increasingly important trading partner of Hong Kong, along with the US, Japan and the EU. Insofar as China's business cycles are isolated from those of the developed countries (see Chapter 3), involving China in Hong Kong's trade can diversify the risk of market cycles.[10]

Entrepot trade also has a diversification effect on production risk. During the last decade, due to increasing global competition, many Asian economies have been compelled to specialize in accordance with their comparative advantages (Hong Kong Bank 1997b). While specialization can deliver benefits, such as economies of scale, it also raises the vulnerability of the economy toward sector-specific disturbances (ibid.).[11] Shifting resources from direct exports to re-exports can avoid specialization in certain end-user products, and thus insulate the economy from the interruption of product cycles.

Additionally, by relocating labor-intensive production to China, the domestic manufacturing capacity in Hong Kong can be devoted to higher value-added products. Presumably, the two types of products look for very different markets. Thus, this can further diversify production and market risks.

In the Mundell-Fleming model, pegging the domestic currency to a foreign currency will hamper the impacts of real demand shocks from the anchor country, but amplify those of nominal shocks. Therefore, the net benefit of joining a particular currency zone depends on the relative prominence of the two types of shock.[12] The modeling results of this chapter show that, if certain conditions are fulfilled, entrepot trade can narrow this tradeoff by augmenting the impacts of real demand shocks from the anchor country and diminishing those of nominal shocks. With the same conditions, but more importantly, entrepot trade can reduce the opportunity costs of choosing one foreign currency instead of another as the nominal anchor.

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[10] However, over the 1990s, Hong Kong is the only economy with an increasing market concentration ratio amongst a number of Asian economies, including China, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand (Hong Kong Bank 1997b). The rising concentration ratio for Hong Kong is largely attributable to OPRT.

[11] An example of this is the episodic contraction of the demand for electronic products in the 1990s.

[12] Here we are concerned with the choice of the nominal anchor, so the impacts of domestic shocks are supposed to be given.

These conditions include: (i) the economy has a relatively large indirect trade sector, (ii) its value-added in re-exports is small, and (iii) its trade partners have relative large direct export sectors. In general, the trade structure of Hong Kong satisfies these three requirements.

Before concluding this chapter, it is worthwhile pointing out possible extensions of the model. The model in this chapter was developed to examine the interaction between entrepot trade and fixed exchange rate regime. Accordingly, the structure of trade is set exogenously. A drawback of this setting is that the model can not account for the evolution of the trade structure of Hong Kong. To extend the model in this direction, one can incorporate in the model endowment differentiation as in the Heckscher-Ohlin-Samuelson model, or productivity differentiation as in the Ricardian model.

Furthermore, the discussion in the text emphasized the influence of China's policy regime upon the development of entrepot trade in Hong Kong. The interrelation between trade structure and fixed exchange rate regime is presented in a static context. One may incorporate in the analysis endogenous interaction between trade volume and exchange rate regime. For instance, Devereux and Voss (1997) demonstrate that a fixed exchange rate regime can promote trade flows by enhancing production specialization. By the same token, it is also plausible that a higher degree of division of labor between two economies reinforces the need to maintain a fixed exchange rate regime between them.

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Appendix 5

Table 5.A1: Definitions of Notations and Composite Parameters

Symbol	Definition and Note
C^i	Consumption of export from country i
C^{ij}	Consumption of indirect export from country j that passes through country i
m^i	Nominal supply of country i
p^i	Domestic output price of country i
r	The world real interest rate
s	Saving rate
y^i_d	Real aggregate demand of country i
y^i	Real output of country i
μ^i	Expansionary real demand shock in country i
π^i	Contractionary nominal shock in country i
Ω	Income elasticity of consumption
λ	Interest elasticity of investment
η	Price elasticity of exports
ϕ	Interest elasticity of money demand
θ_1	Share of gross output of the direct exports in the total exports of A to B
θ_2	Share of gross output of the direct exports in the total exports of A to C
θ_3	Share of gross output of the direct exports in the total exports of B to C
θ_4	Share of gross output of the direct exports in the total exports of C to B
θ_5	Share of value-added of A in its re-exports to C
θ_6	Share of value-added of A in its re-exports to B
	Note: $\theta_j \in [0,1], j = 1,2,\ldots,6$
κ_1	$= \theta_1[\theta_1+\theta_6(1-\theta_1)]^{-1}$;
	share of total value-added of the direct exports in the total exports of A to B
κ_2	$= \theta_2[\theta_2+\theta_5(1-\theta_2)]^{-1}$;
	share of total value-added of the direct exports in the total exports of A to C
κ_3	$= \theta_3[1-\theta_5(1-\theta_3)]^{-1}$;
	share of total value-added of the direct exports in the total exports of B to C
κ_4	$= \theta_4[1-\theta_6(1-\theta_4)]^{-1}$;
	share of total value-added of the direct exports in the total exports of C to B

e_j^i	price of \$$i$ in terms of \$$j$; $e_b^a = e_c^a + e_b^c$
α_1	$= \lambda(1\text{-}\Omega)^{-1}$
α_2	$= (1\text{-}\Omega)^{-1}$
α_3	$= \Omega(1\text{-}\Omega)^{-1}$
α_4	$= [\kappa_1 + \kappa_2 + (1\text{-}\kappa_1)\theta_6 + (1\text{-}\kappa_2)\theta_5]\eta(1\text{-}\Omega)^{-1}$
α_5	$= (\kappa_1 + \theta_6 - \kappa_1\theta_6)\eta(1\text{-}\Omega)^{-1}$
α_5^*	$= (\kappa_2 + \theta_5 - \kappa_2\theta_5)\eta(1\text{-}\Omega)^{-1}$
α_6	$= (2\Omega\phi\text{-}\lambda)[\phi - (2\Omega\phi - \lambda)]^{-1}$
β_4	$= (1\text{-}\kappa_3)\theta_5\,\eta(1\text{-}\Omega)^{-1}$
β_4^*	$= (1\text{-}\kappa_4)\theta_6\,\eta(1\text{-}\Omega)^{-1}$
β_5	$= \eta(1\text{-}\Omega)^{-1}$
ε_4	$= (1\text{-}\kappa_4)\theta_6\,\eta(1\text{-}\Omega)^{-1}$
ε_4^*	$= (1\text{-}\kappa_3)\theta_5\,\eta(1\text{-}\Omega)^{-1}$
ε_5	$= (1 + \kappa_4\theta_6 - \theta_6)\eta(1\text{-}\Omega)^{-1}$
ε_5^*	$= (1 + \kappa_3\theta_5 - \theta_5)\eta(1\text{-}\Omega)^{-1}$

Chapter 6

Property Markets & Exchange Rate Arrangement

Part I

Synopsis 6

Property related activities dominate a lot of economic areas in Hong Kong, such as loan making, employment, government revenue, and national output. The government has almost monopolized all land resources. Consequently, delivering appropriate land and housing policies becomes extremely important for both social and economic considerations. The monetary instrument has been surrendered under the currency board arrangement, limiting the demand side management capacity of the authorities. As a result, supply side management has become increasingly in demand. The partial equilibrium model developed in this chapter shows that unanticipated demand shocks could lead to overshooting in housing price. On the other side, anticipated supply shocks could cause overshooting in housing output. The result highlights the challenges in using land and housing policies for macroeconomic management.

6.1 INTRODUCTION

The study of property markets is already a well-developed and 'self-contained' area, lying between the disciplines of economics and urban studies. An overwhelming proportion of the studies in this area focus on the microeconomic issues of real estate markets, such as inter-regional price and rental rate differentials, labor migration and housing demand, property taxes, and housing finance. The macroeconomic aspects of property markets, such as the supply side impact of land policies on business cycles, and the effectiveness of property taxes in absorbing demand shocks, have been largely overlooked.[1] Whereas the interrelation between property markets and the rest of the economy has already been quantitatively examined (Meen 1990). On the policy making front, housing investment is widely used as one of the indicators for short- to medium-term economic forecasts. During the recent Asian economic crisis, it was observed that several disrupted economies experienced significant property booms before their currency problems surfaced. One hypothesis is that rocketing property prices raised production costs in those economies and, hence, severely undermined their competitiveness.

The Hong Kong property market has been one of the most buoyant in Asia and probably the world. The list of statistics in Table 6.1 clearly indicates the unique and crucial role of property markets in the Hong Kong economy. For instance, about 40 percent of GDP and 50 percent of government revenue comes from real estate related activities (Granitsas 1999; Shaw 1999). In 1992, purely property and construction stocks made up about one quarter of the total stock market capitalization, compared to below 5 percent in the US, 6 percent in Japan, 11 percent in Singapore, and 19 percent in Thailand (Walker, Chua et al. 1995). The inclusion of other real estate related stocks further raises the share to 45 percent (ibid.). In 1998, over 45 percent of the total credit made by the financial sector was property related (Yeh 1999).

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[1] A noticeable exception is Matsuyama (1990).

Table 6.1: Statistics of Hong Kong Property Markets

Item	Statistics
Value of property as an asset	In 1993, the estimated value of the total stock of private property was close to US$400 billion. Per capita wealth of property assets was US$70,000, and that for each economically active person was almost double.
Contribution to Gross Domestic Product	During 1982-91, the average contribution of the property and construction related activities to GDP was over 24 percent. In the late 1990s, the proportion rose to no less than 40 percent.
Provision of employment	During 1983-92, the property and construction sector alone employed over 8 percent of the total labor force on average, not yet including the employment in other property related activities.
Contribution to Gross Fixed Capital Formation	During 1983-92, over 60 percent of annual gross fixed investment was on property development.
Stock market capitalization	In 1992, purely property and construction stocks made up about 25 percent of the total stock market capitalization. The inclusion of other real estate related stocks raises the share further to 45 percent.
Loans for construction and property development	During 1984-93, over 35 percent of all bank loans went to the property and construction sector. In 1998, over 45 percent of total loans were property related.
Public expenditure and revenue	During 1984-93, revenues from property related activities contributed over 33 percent to total government revenue. The figure increased to 40-50 percent in the late 1990s. In the mid-1990s, over 30 percent of all government expenditure was on property.
Demand for public housing	Over half the total population currently lives in subsidized housing. One public housing unit is completed every 13 minutes.
Household expenditure on private housing	During 1989-90, housing absorbed 30 percent of household income on average. The share rose to 70 percent during the boom period of 1996.

Source: Walker, Chua et al. (1995), Lui (1997), Shaw (1999), Yeh (1999), and Granitsas (1999).

At the same time, the property market of Hong Kong has also been one of the most volatile in the region. Throughout the 1990s, a swing of property prices over 20 percent per annum was not unusual. The strong business cycles are the result of external influences as well as internal constraints.

Externally, the property boom during 1991-94 was triggered by China's economic recovery and exacerbated by expansionary monetary policy from the US. When the bout of property asset bubbles was lurking right around the corner, the Asian crisis unfolded. Property prices were dragged down by about 50 percent. In the last quarter of 1998, the price index of residential dwellings was back to its pre-1994 level, and that of private offices was below its 1993 level by almost one-third.

Before the Asian crisis, in spite of strong cyclical fluctuations, by and large property prices in Hong Kong had maintained very strong surging momentum. During 1987-96, the average annual inflation rate of private residential housing was over 18 percent, more than double of that of the consumer price index (CPI). A fundamental cause of such high property inflation is an internal constraint – the scarcity of land resources. With a special leasehold land system, almost all land resources in Hong Kong are possessed by the government. High property prices have put enormous financial pressure on most households. A rough estimation shows that in 1996 mortgage payments for an average residential flat absorbed as much as 70 percent of the income of a median level income family (Lui 1997). Indeed, over half the total population is currently living in various types of subsidized housing.

The fact that the government monopolizes most land resources and runs extensive public housing programs gives rise to its enormous influence over private property markets. In fact, in the run up to the hand-over, it was observed that the government has adopted a more activist land policy (Husain, Duenwald et al. 1999). For example, during the Asian crisis, when the slump in property prices posed a serious threat to the banking sector, which has vast exposure to mortgage loans, the government straightforwardly suspended land sales for nine months to stabilize property prices. An authority under a freehold land system does not have the luxury to resort to such a policy.

The special institutional features and high volatility of the Hong Kong property market have obviously raised a lot of theoretical and policy issues. A list of references is in order. Walker, Chua et al. (1995) and Churchouse (1990) provide useful statistics and facts about Hong Kong property markets. Tse (1994) conducts a comprehensive theoretical and empirical comparative study of the property markets in Hong Kong, Singapore and Taiwan. Renaud, Pretorious et al. (1997) introduce readers to an intuitive diagrammatic model for Hong Kong property markets, along with detailed evaluation of recent government policies. Ho (1992) analyzes the function of rent control as a substitute for public housing. Wong and Liu (1988) and Li and Yu (1990) study the redistribution effects of public housing programs. Consumer Council (1996) addresses the issue of imperfect competition in property markets. Blundell (1996) reviews housing policy in Hong Kong before the hand-over. And the series of "The Other Hong Kong Report" provides comprehensive background information for the development of Hong Kong property markets.

Despite all these research efforts aimed at understanding the microeconomics of Hong Kong property markets, two issues have largely been neglected. Firstly, while it is widely accepted that the peg between the Hong Kong dollar and the US dollar attributed to property inflation in the mid-1990s (Lui 1997), there is a lack of systemic studies of the interaction between the exchange rate arrangement and property markets. Secondly, there has long been a vacuum of general equilibrium analyses of land and housing policies in Hong Kong, especially under an open economy framework. In view of these insufficiencies, this study aims to disentangle the interrelation between the exchange rate arrangement, property markets, and the rest of the economy.

The study is divided into two parts, corresponding to this chapter and the next chapter, respectively. This chapter provides a review of the latest developments in Hong Kong property markets. A partial equilibrium model is presented to explore some basic but important economic features of property markets. The next chapter extends the model into an intertemporal general equilibrium model. Both models are used to evaluate some government policies in Hong Kong.

The next section describes the features of Hong Kong property markets and the role of government. Changes in government policies during the transition and the Asian economic crisis, along with their impacts, are reviewed. Section 3 presents the partial equilibrium model and some analytical results, and the last section concludes.

6.2 PROPERTY MARKETS OF HONG KONG

It has long been praised that positive non-interventionism is the gospel of policy making in Hong Kong. Nevertheless, this assertion is far from being accurate when it comes to housing. The Hong Kong government commenced the first public rental housing program in 1953, in order to shelter a large number of inhabitants who had lost their hillside squatters in a blaze. The government's participation in residential housing markets has been deepening ever since. In 1972, the percentage of the total population living in various types of public-subsidized housing had reached 41 percent, and further increased to 52 percent in 1996 (Lai 1994; Howlett 1997). Nowadays the public housing program consists mainly of public rental housing, Home Ownership Scheme, Sandwich Class Housing Scheme, and Home Purchase Loan Scheme (Dodsworth and Mihaljek 1997). The last three schemes are to assist households to purchase their own units.

The role of the Hong Kong government in property markets is not limited to the provision of public housing. It has extensive influence in all real estate markets, due to its monopolistic position in controlling land resources. In a lot of market economies, most land is permanently owned by the private sector. That is, the land is freehold land. However, in Hong Kong almost all the land is possessed by the government (statutorily by the Crown before 1997).[2] The private sector can access public land resources only through a leasehold system, under which land is leased by the authorities for a certain period of time as well as for a specified function. Before the hand-over the standard lease term was 75 years. After the hand-over the term is 50 years (Mihaljek, Hussain et al. 1998).

Land is disposed via three channels: public auction, public tender, and private treaty grant (Yeh 1999). Public auction is an open bidding process. Public tender is called normally for land with very restricted purposes and, thus, few interested parties. Private treaty grant is used mainly for public constructions such as public housing, public utilities, schools, hospitals, and projects related to charity and religious activities. The disposal of land via public auction and public tender is commonly referred to as "land sale" in Hong Kong, even though the land is leased rather than actually sold.

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[2] A limited amount of freehold land can be found in the New Territory where indigenous people had inhabited before Britain colonized Hong Kong in 1841.

6.2.1 The Days of Being Hong Kong, Britain

6.2.1.1 Supply and Demand

Complying with a fundamental economy principle, property prices in Hong Kong are governed by demand and supply. There are several factors that give rise to a continuous growing demand for housing (Lai 1994):

- a sustained growth of household income;[3]
- low interest rates imported from the US via the currency board arrangement;
- huge foreign capital inflow into property markets, particularly from China;[4] and
- a steady growth of the population plus a continuous contraction in unit household size.[5]

On the other hand, the supply of housing is constrained by some other factors (ibid.):

- geographical features such as a small overall size with numerous hills;[6]
- controls over urban densities, plot ratios, and renewal of private agricultural land;
- the shortage of construction labor; and
- the Sino-British agreement on land disposal.

The demand side determinants are either largely out of the hands of the administration (like capital inflow) or locked in by other policy considerations (like the currency peg). As a result, government intervention mainly resides on the supply side. It should be emphasized that although the geographical size is largely inherited, the supply of land in

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[3] Over the period 1975-95, real per capital GDP grew by 300 percent (Renaud, Pretorious et al. 1997). Furthermore, Tse (1994) finds that the income elasticity of housing demand in Hong Kong is over one.

[4] Hastings and Li (1996) estimate that China accounted for nearly US$2 billion investment in Hong Kong property markets in 1991 and 1992.

[5] The rate of household formation over 1975-95 was 4.9 percent per annum, while the population annual growth rate was only 1.3 percent (Renaud, Pretorious et al. 1997).

Hong Kong is far from inelastic. Through massive land reclamation, hill terracing, and urbanization of rural areas, the government has managed to increase the amount of utilizable land. In 1999, the total area of Hong Kong is 1,095 square kilometers,[7] about 5.5 percent of which came from reclamation, equivalent to 75 percent of the current size of Hong Kong Island (EIU 1998-99).

However, raising the supply of utilizable land does not imply a simultaneous increase in land disposal. The 1997 issue had imposed a constraint on the latter before rather than after the hand-over. In 1984, London and Beijing signed the Sino-British Joint Declaration, which has provided the blueprint for transitional and post-1997 arrangements in Hong Kong. According to the Declaration, before the hand-over, land disposal was statutorily limited to 50 hectares a year, excluding land granted for the construction of public facilities. The rationale for this rigid arrangement is political. The Chinese government tried to prevent its counterpart from excessively selling land before 1997 and, thus, reducing land sale revenues for the Hong Kong Special Administrative Region (SAR) government.

To cater for unforeseen situations, additional amounts of land could still be leased, but only after the British/Hong Kong authorities had sought agreement from the Chinese side. As a means to stabilize property prices, from 1994-95 onwards, the amount of land disposed every year substantially exceeded the 50 hectares limit. Figure 6.1 records the amount of residential land disposed over the period of 1985/96 to 1997/98. But the decelerating effect on property inflation was short-lived (see below). More importantly, as the negotiation was conducted on a year-by-year basis, it precluded the possibility of pre-announcing future land sale programs to thwart speculation.

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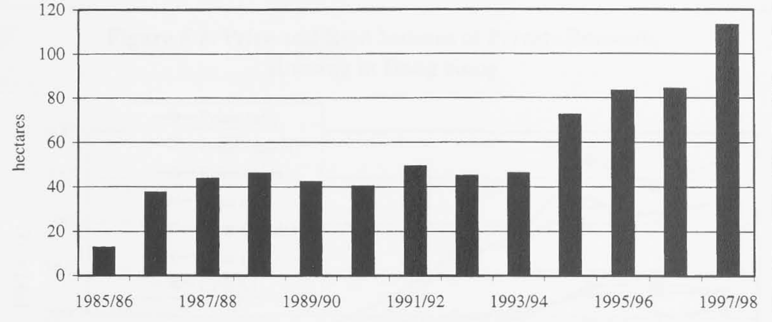
[6] The total area of Hong Kong territory is only about 1050 kilometer square, but 80 percent of this is mountainous (Renaud, Pretorious et al. 1997).

[7] This includes Hong Kong Island (80 sq km), Kowloon (47 sq km), New Territories (794 sq km), and outlying Islands (174 sq km).

Figure 6.1: Residential Land Disposal in Hong Kong



Source: The Housing Bureau of the Hong Kong Government (http://www.info.gov.hk/hb/).

(a) For the period between 1985-86 and 1996-97, the figures represent the total residential land approved by the Sino-British Land Commission. For 1997-98, the figure represents the total area of residential land disposed.

6.2.1.2 Property Inflation

Being a monopolist of land resources the government can easily extract economic rent from the public. During the booming period of 1996-98, the average annual contribution of land sales to total government revenue stood at 28 percent (Yeh 1999). Land cost accounts for approximately 60 to 70 percent of the total value of property assets (Renaud, Pretorious et al. 1997). Not surprisingly, the impact of the scarcity of land was transmitted into sky-high pricing of real estate.

Figure 6.2 plots the price and rental indexes of private domestic (residential) housing during 1987-96.[8] Over the decade, property inflation was far higher than general inflation. The price index of overall residential housing increased by an average annual rate of more than 18 percent, and the rental index by nearly 11 percent, compared to below 9 percent of CPI. This implies that during this period capital gain instead of rental payment constituted the main source of profits in real estate investment. There were also

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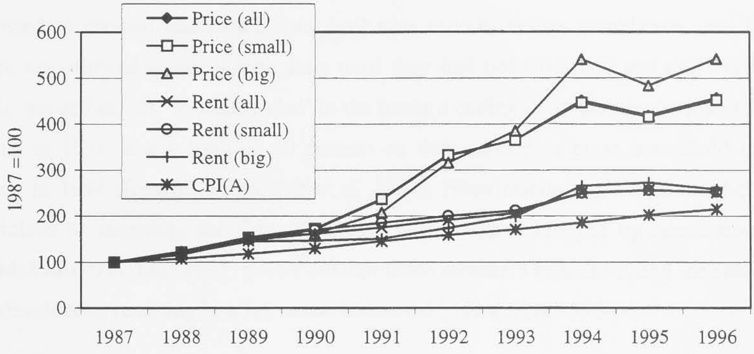
[8] Private domestic units are defined as "independent dwellings with separate cooking facilities and bathroom (and/or lavatory)" (Rating and Valuation Department 1997:27).

noticeable differences between small units (less than 100 meter square) and big units, with the price of the latter being more volatile.

Figure 6.2: Price and Rent Indexes of Private Domestic Housing in Hong Kong



Source: The Housing Bureau of the Hong Kong Government (http://www.info.gov.hk/hb/).

The upsurge of property prices was particularly strong over 1991-94, when China was rapidly recovering from post-Tiananmen economic depression. Due to strong business linkages between the two economies, that led to a boom in Hong Kong. Fueling the situation was the lowered interest rates imported from the US via the linked exchange rate system. As the Hong Kong inflation rate was well above the US level, domestic real interest rates and, hence, the user cost of housing capital – defined as the real mortgage rate less the appreciation rate – became negative (Renaud, Pretorious et al. 1997). Thereby, a straightway means of profit making was to borrow from banks to invest in real estate markets. This inevitably encouraged property speculation. Furthermore, as property inflation overwhelmed general inflation, inflation-hedging assets were sought. Naturally, real estate itself could provide an answer to that request. A property inflation spiral was thus formed, especially in the residential housing market.

Judging that the fierce property inflation was largely ascribed to speculation,[9] the government set up a task force to combat speculative activities. Under the currency board arrangement, monetary instruments have already been surrendered. Consequently, the authorities resorted to administrative measures such as property transaction taxes, mortgage limits, and restrictions on pre-sale practices. For instance, developers were not allowed to pre-sell unfinished flats until nine months before completion, and buyers were not allowed to resell their flats until they had been finished and delivered.[10] As well, the authorities 'recommended' to the banks a ceiling of 70 percent on loan to value ratios in 1991, and a limit of 50 percent on debt-service to gross household income ratios in 1994 (Renaud, Pretorious et al. 1997). Notwithstanding, the authorities were criticized as impeding the flow of market information conveyed by speculators (Lai 1994; Lui 1997). Lui (1997) points out that those measures actually raised the risk borne by developers, resulting in a fall in the housing supply during 1995-96.

Due to the actions of the government, residential housing prices declined substantially. By the end of 1995, prices of residential and office property had fallen by 20 percent and 25 percent, respectively, from their peak values in April 1994 (Mihaljek, Hussain et al. 1998). Rental rates for prime office space became more competitive and comparable to that in Singapore. As the construction and real estate sectors contributed on average 10 percent to GDP (Dodsworth and Mihaljek 1997), in addition to the wealth effect associated with the downward adjustment of property prices, economic growth significantly weakened throughout 1995 until the second half of 1996.

Nevertheless, the downturn of the property market was short-lived. Property prices rebounded dramatically in 1996. The ground lost in the residential housing market during 1994 and 1995 was completely recovered in just half a year. From the last quarter of 1995 to the second quarter of 1996, the residential property price climbed from the bottom back to the peak level of 1994 (Figure 6.3). The reversal of property prices was due to the growth in demand from returning emigrants, a sustained income

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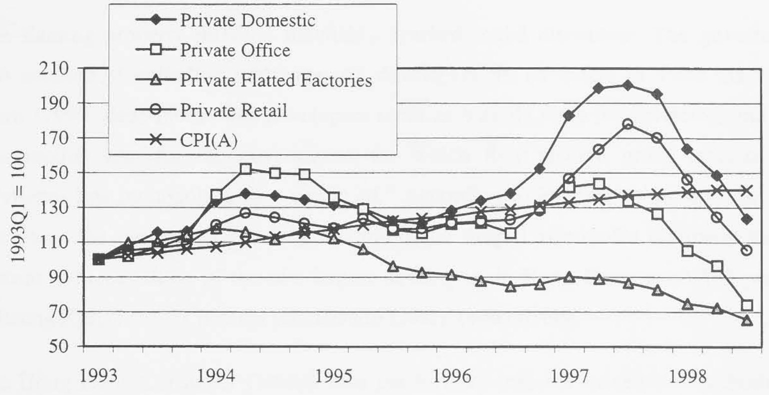
[9] This judgement is dismissed by some people; for example, see Lui (1997).

[10] Also helping to cool down the markets were the contraction monetary policies in the US and China, respectively, after 1994, which led to outflow of foreign capital from Hong Kong property markets (ibid.).

rise, and negative interest rates, as well as a shortage in supply that had lasted from the previous cyclical downturn (Husain, Duenwald et al. 1999).

Figure 6.3: Property Price Indexes of Hong Kong



Source: The Housing Bureau of the Hong Kong Government (http://www.info.gov.hk/hb/).

The momentum of property inflation was deemed to be almost unstoppable in the run up to the hand-over. This raised concerns about whether property prices had already deviated from the movement of *fundamentals* and, thus, posed a risk of asset bubbles onto the economy. Mihaljek, Hussain et al. (1998) point out that, over 1996-97, the number of households increased at a pace faster than the production of both private and public housing, creating a demand push effect on property prices. Besides, from the second quarter of 1994 to that of 1997, residential property prices rose by 32 percent, compatible to the rise of nominal payroll per person (55 percent) and construction costs (28 percent). However, a more recent IMF study suggests otherwise. Husain, Duenwald et al. (1999) assert that their preliminary empirical research shows clear evidences of asset bubbles.[11]

An interesting aspect of Figure 6.3 is that the price fluctuation of private flatted factories is much more moderate relative to those of others. In fact, both the rental rate and the price of private factories have gone down continuously since 1994, even compared to the CPI. This is largely ascribed to the shift of *space-intensive* manufacturing industries to neighboring China (Mihaljek, Hussain et al. 1998).

6.2.1.3 Monopolistic Developers

The flaming property inflation inevitably sparked social discontent. The government was accused of colluding with property developers. In an article in Time magazine, Shaw (1999) denounces "The developers serve as both de facto tax collectors and as a construction arm for the government, for which they receive profit margins and privileges few monopolists dare dream of." According to his estimation, over the past five years, the average pre-tax profit margin of the alleged monopolist Microsoft was 42 percent, whereas those of the two largest developers in Hong Kong were 133 percent (Cheung Kong) and 71 percent (Henderson Land), respectively.

The Hong Kong Consumer Council also put forward massive evidence to indicate the possibility of developers manipulating market powers (Consumer Council 1996). The Council's study reveals that the first hand market in Hong Kong has a high degree of concentration. During 1991-94, 25 percent of new private housing was supplied by only one developer, 55 percent by four developers, and 70 percent by seven developers. After 1981, no new firms were able to capture 5 percent or more of the first hand market. The long-term vacancy rate of the flats owned by developers was 11 percent in 1995, more than double the 4 percent overall market rate. Nevertheless, the study stops short of judging major developers as oligopolies, citing that economies of scale, a large degree of market segregation, a high market entry cost, successful business strategies and a limited supply of land could also attribute to the outcome.

Besides the affordability of residential housing, there have been concerns about whether property inflation will erode the comparative advantage of Hong Kong that has arisen from a low tax system. The apprehension is legitimate, as land cost is virtually a hidden tax. Before the Asian currency crisis, Hong Kong had once bypassed Tokyo in

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[11] But they do not report the details of the empirical evidence.

becoming the most expensive place for doing business in the world.[12] High running costs have already forced companies like Cathay Pacific and the Hong Kong and Shanghai Bank Corporation to move parts of their operations to other countries (Yeh 1999).

6.2.2 The Days of Being Hong Kong, China

Under the leadership of the first chief executive, Tung Chee-hwa, the SAR government seems to emphasize long-term objectives as much as positive non-interventionism. On top of the government's agenda is the housing issue. As emphasized repeatedly by Tung (1998):

"Property is one of the most important components of the economy...the residential property market in particular serves as both a major vehicle for the personal investment of wealth and a public barometer of social stability."

A long-term housing policy was announced soon after the inauguration of the SAR government. The policy mix consists of three major ingredients:

- expanding annual housing production from 80,000 in 1997 to 85,000 units by 2000, out of which 50,000 are public housing and 35,000 private (Table 6.2);
- increasing the rate of home ownership to 70 percent by 2007, part of which will come from the sale of 250,000 public rental apartments to tenants; and
- shortening the waiting period for public rental housing from 6.5 to three years by 2005.

Behind the policy initiatives are economic as well as political considerations. As depicted previously, high property prices continued to be the major problem facing most households during the transition. Measures introduced in 1996 to speed up land development, and in 1997 to curb speculations, were considered ineffective (Yeh 1999).

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[12] High property prices also engender high labor wages. A survey on the median salary of senior managers ranked Hong Kong the highest in the Asian and Pacific region in 1997-98 (Yeh 1999).

Property prices rocketed up throughout the first three quarters of 1997 (Figure 6.3). That raised the alarm of property asset bubbles which had just ruined the Japanese economy. On the other side, demographic projection suggests that the population will grow by over 15 percent in just ten years (Tung 1998), partly attributed to a continuous influx of Chinese migrants. Against such a background, easing the housing problem becomes critical to stabilizing the economy.

Table 6.2: Projection of Housing Production Before and After the Asian Crisis

	Projection in August 1997			Projection in September 1998			
	Public housing [a]	*Private housing*	*Total*	*Public housing* [b]	*Sandwich class housing*	*Private housing*	*Total*
1997-1998	43,000	22,000	65,000				
1998-1999	39,000	36,000	75,000	20,900	5,400	12,900	39,200
1999-2000	51,000	40,000	91,000	57,700	12,400	7,700	77,800
2000-2001	113,000	54,000	167,000	94,600	12,400	23,000	130,000
2001-2002	60,000	38,000	98,000	42,300	3,200	5,200	50,700
2002-2003				47,100	3,200	5,000	55,300
2003-2004			261,000	45,000	10,000	6,300	61,300
2004-2005				37,300	10,000	11,000	58,300
Total			757,000				472,600

Source: Chiu (1999).

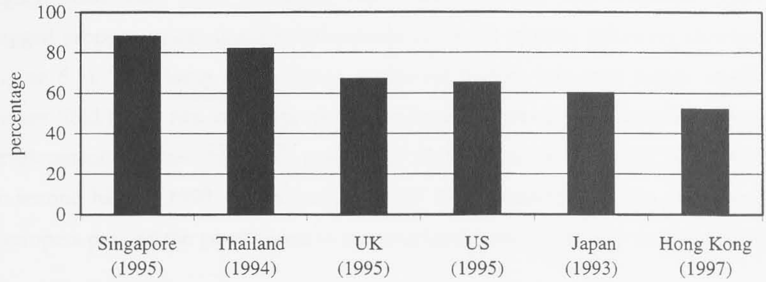
(a): This includes public rental housing, Home Ownership Scheme, Private Sector Participation Scheme, and Sandwich Class Housing Main Scheme.

(b): This includes public rental housing, and Home Ownership Scheme.

Moreover, Figure 6.4 reveals that in terms of owner occupation ratios Hong Kong is not only incomparable to Singapore and Thailand, but also behind the US, the UK, and Japan. Promoting home ownership by encouraging tenants of public housing to switch to owner occupation tenures will economize the subsidies on public housing (Chiu 1999).

Politically, the endeavor of the government, if it flourishes, will boost the image and reputation of the newly established SAR government (ibid.). This is essential, as the public perceived that the 'election' of Tung as chief executive was virtually arranged by Beijing, in which they had no participation.

Figure 6.4: Owner-occupation Rates in Hong Kong & Other Countries



Source: The Housing Bureau of the Hong Kong Government (http://www.info.gov.hk/hb/).

Accompanying the new housing target is a renewed land policy. As the 50 hectares restriction has ceased to exist with the change of sovereignty, the SAR government is now free to announce medium- to long-term land disposal programs. In his first policy address Tung (1997) signifies the crucial aspect of doing so:

"It is not just a matter of producing more flats, but of ensuring an even annual supply and a high degree of predictability that supply will be sustained. That is the only way to ensure moderate prices."

To achieve this task, the authorities have committed to formulating a rolling five year land disposal program against a ten year planning horizon, as well as to streamlining the procedures for housing development. Furthermore, to meet the demand for more land in the future, the government has speeded up the urbanization of rural areas and island districts, and the redevelopment of old urban areas.

6.2.3 The Stormy Days of Being Part of Asia

The promised growth in supply under the new housing policy crashed with an unanticipated collapse in demand triggered by the Asian crisis. To defer speculative attacks against the Hong Kong dollar, interest rates were maintained at high levels throughout 1998. The average interest rate charged on new mortgages was raised from 9 percent in July 1997 to 11 percent in June 1998 (Chiu 1999). The economy was brought into recession for the first time in 13 years.

High interest rates, credit crunches, rising unemployment and economic uncertainty dragged property prices down by 50 percent in the 12 months following October 1997 (Figure 6.3). The slump in the luxury apartment market was even larger, reaching 60 percent (ibid.). The two largest property developers, Cheung Kong and Herderson Land Development, reported net profit plunges of 65.3 percent in 1998 and 76.8 percent for the second half of 1998, respectively (SCMP 1999). Reacting to this situation, major developers pressed the government to suspend land sales to stabilize property prices.

Table 6.3: Loans for Use in Hong Kong by Sector

Sectors	June 1995 (HK$ million)	Out of total (%)	June 1998 (HK$ million)	Out of total (%)
Manufacturing	96,394	7.25	105,950	4.82
Transport and transport equipment	69,812	5.25	105,866	4.81
Wholesale and retail trade	157,275	11.83	195,428	8.89
Financial concerns	160,086	12.05	254,397	11.57
Building, construction, property development and investment	255,555	19.23	440,286	20.02
Individuals to purchase flats under the HOS and the PSPA [a]	40,323	3.03	66,685	3.03
Individuals to purchase other residential property	280,300	21.09	499,404	22.71
All Others	269,298	20.26	530935	24.14
Total	**1,329,043**	**100**	**2,198,951**	**100**
Property market related loans	*550,951*	*41.45*	*1006,375*	*46.00*

Source: Monthly Statistical Bulletin, Hong Kong Monetary Authority, December 1995 and June 1998 (the second one cited from Yeh (1999)).

(a): HOS is House Ownership Scheme, PSPA is Private Sector Participation Scheme.

The fall in property prices has had enormous spillover effects on the financial sector, as almost half of the loans in Hong Kong were property related (Table 6.3). The position of the banking sector was already weakened by fierce competition in the mortgage market before the crisis. The interest rate margin between the lending rate and the prime rate fell from about 1.75 percent in 1996 to not more than 0.75 percent in 1997 (Cheng, Wong et al. 1998). The dramatic price slump turned real estate from an inflation-hedging asset into a negative equity (Chiu 1999). Allowing further decline of property prices could risk solvency of the banking sector.

On the other hand, artificially dampening the downward adjustment of property prices might come at a cost of prolonging the economy's recovery from recession. This point is important because, given the rigidity of the monetary regime and the prudence of the fiscal regime, Hong Kong has been relying on its high flexibility in factor prices and resource reallocation in maintaining economic balance (Dodsworth and Mihaljek 1997). Once price flexibility is impeded by policy intervention, the economy may have lost the only remaining adjustment mechanism.

Recognizing the pressure on the banking system, the administration eventually decided to scale down the original long-term housing program.[13] The Sandwich Class Housing Scheme, which provides subsidized owner occupation tenures for middle income families, has been suspended. The most drastic and controversial move came in June 1998. A moratorium was imposed on land sales for nine months until the end of March 1999. In effect, this decision held off 30,000 housing units (Yeh 1999). This was the first time the government had suspended land sales in more than 20 years (EIU 1998-99).

During September to December 1998, the government took further action to stimulate the property markets, lifting almost all the anti-property-speculation measures introduced during 1994-97 (Chiu 1999). For instance, the Hong Kong Monetary Authority (HKMA) relaxed the long-standing 70 percent restriction on the ratio of mortgage loan to property value, with an extra 15 percent lending being guaranteed by the government owned Hong Kong Mortgage Corporation. This arrangement ensures that private banks' exposure to mortgage loan is still capped below the 70 percent ceiling (EIU 1999).

In February 1999, the government announced the resumption of land sales after the expiration of the moratorium. A new application system has been introduced to help

[13] However, the policy backfired in public debate, as the government was perceived to bend to the pressure of large property developers at the expense of consumers' interests.

maintain the flexibility of land sales and at the same time the stability of property prices. Under the new arrangement, a developer may apply to the government for the sale of any listed sites, provided it offers a minimum price. If the government considers the offered price reasonable, it will put up the site for public auction or tender. The administration claims the system will enable the market to decide the optimum amount of land to be disposed and the optimum timing of disposal (Hong Kong Government 1999).[14] Property prices seemed to stabilize by the first quarter of 1999.

6.2.4 Issues Raised

To summarize, the change of political landscape has significant implications for the development of property markets in Hong Kong. Before the hand-over, land supply was restrained by the Sino-British arrangement, while the interest rate instrument was subdued by the linked exchange rate system. After July 1, 1997, the constraint on demand side management remains as long as the currency board arrangement is in place. Nonetheless, on the supply side, the authorities now have much larger scope to flex their muscles. This change has opened up lot more possibilities and, thereby, a number of theoretical as well as policy issues. To name a few:

- In an economy in which the government monopolizes all land resources, what is the optimal supply of land?
- Given the economy with heterogeneous incomes, what are the redistribution effects of government intervention in public and private property markets?
- What are the most effective instruments for intervention in property markets?
- How do property market oligopolies, which engage in long-term irreversible investments, behave under the uncertainties of land disposal and macroeconomic environment?

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[14] For more details about the new disposal system, visit the web-site of the Lands Department of the Hong Kong government (http://www.info.gov.hk/landsd/landsale/pamph.htm).

- What are the roles of mortgages in both capitalization and the formation of asset bubbles?
- How does the exchange rate arrangement, especially a currency peg, interact with property markets?

To keep in line with the theme of the whole thesis, this chapter only concentrates on the issue of the effectiveness of intervention instruments. The next chapter focuses on the interrelation between the exchange rate arrangement and property markets. Nevertheless, other issues can be developed into other research projects in the future.

6.3 PARTIAL EQUILIBRIUM MODEL OF PROPERTY MARKET

The purpose of this section is to explore some fundamental economic properties of real estate markets. Although the model has far less features than the general equilibrium model presented in the next chapter, it manages to capture a number of the issues previously discussed. These include (i) the effectiveness of a mortgage limit as an anti-speculation instrument; (ii) the consequence of rising household income; (iii) the effect of changing the interest rate on mortgage loans; and (iv) the impact of property inflation.

The model is based on Miles (1994). It consists of a representative household and a representative competitive property developer. A feature of the model is that the household makes use of a mortgage to purchase dwellings. All the macroeconomic variables are exogenous, including the interest rate, the money supply, and the price of non-durable goods. The nominal wage is fixed too, so employment is demand determined. The quantity and relative price of housing are determined by a market clearing condition, but expected property inflation is given. The notations of the model are listed in Appendix 6.

6.3.1 Household

The maximization problem confronted by the household is as follows (the time subscripts are skipped for notational neatness):

Maximize $\int_0^\infty U(c,h,m)e^{-\mu t}dt$

subject to:

$$y+\dot{z}=c+p_h(I_h+\tau_h h)+\pi_c m+rz+\dot{m} \tag{6.1a}$$

$$I_h=J_h[1+\phi_h(J_h/h)] \tag{6.1b}$$

$$\dot{h}=J_h-\delta_h h. \tag{6.1c}$$

The economy is closed. The household consumes three goods: non-durable goods (c), housing (h), and liquidity (m). The household earns a fixed income (y) and borrows a new amount of mortgage loan ($\dot{z}$) every period (equation 6.1a). It spends on non-durable goods (c), housing investment ($p_h I_h$), the property tax payment ($p_h \tau_h h$), the inflation tax payment ($\pi_c m$), and the interest payment on the mortgage (rz), and saves the rest as financial assets ($\dot{m}$). Housing is modeled as a consumption capital, so its accumulation is subject to an adjustment cost ($\phi_h J_h^2/h$) and depreciation ($\delta_h h$), as commonly done in modeling physical capital (equations 6.1b and 6.1c).[15] The specification implicitly assumes that one unit of housing stock generates one unit of housing services, and the rent of a dwelling is just equal to its price. Therefore, the property tax is actually levied on the implicit rent earned from the property. Altering these simple one-to-one relations will not change the properties of the model; for example, see Turnovsky and Okuyama (1994). Financial asset is equal to money balance net of outstanding mortgage debt.

The household is supposed to borrow by using its property as collateral:

$$\theta p_h h \geq z\ ;\ \theta \in [0,1]. \tag{6.2a}$$

θ is the mortgage loan to housing value ratio; the larger the borrowing capacity of the household, the larger the ratio. To examine the impact of mortgage limit on the property

[15] More detailed discussion about the adjustment cost of housing capital can be found in Chapter 7.

market, it is necessary to assume the household is financially constrained. That is, equation (6.2a) is binding:

$$\theta p_h h = z \; ; \; \theta \in [0,1]. \tag{6.2b}$$

Requiring θ to lay within [0,1] implies that there is no need to impose the no-Ponzi game condition on the household. This is because, at any point of time, the net value of the assets held by the household is *at least* equal to the real money balance, which is always non-negative. This point is especially important when the real interest rate on mortgage loans measured in the property price (r_h) is negative:

$$r + \pi_c - \pi_h = r - \pi = r_h < 0. \tag{6.2c}$$

Without the constraint (6.2b) the system will explode under this circumstance, as mortgage borrowing will tend to infinitely large. Equation (6.2c) is realized when the relative inflation rate of property outpaces the mortgage interest rate, as happened in Hong Kong during 1991-94 (see Section 6.2.1.2).

Equation (6.2b) restricts that, if the property price falls, lenders can immediately contract the size of the mortgage. In reality, it is hard to maintain the asset to liability ratio in such a strict sense. In fact, when property values plummet substantially, and abruptly, those financial institutes which have a sizable mortgage loan exposure may not be able to balance their balance sheets and become insolvent.

The current value Hamiltonian of the problem is given as follows:

$$H_1 \equiv U$$

$$+\lambda_1\{y - c - p_h J_h[(1-\theta) + \phi_h(J_h / h)] - [\tau_h + (r + \delta_h - \pi)\theta]p_h h - \dot{m} - \pi_c m\}$$

$$+\lambda_2(J_h - \delta_h h - \dot{h}).$$

Besides the original constraints, the other first order conditions are given as follows:

$$U_c = \lambda_1 \tag{6.3a}$$

$$\lambda_1 p_h[(1-\theta) + 2\phi_h(J_h / h)] = \lambda_2 \tag{6.3b}$$

$$\dot{\lambda}_1 = \lambda_1(\mu + \pi_c) - U_m \tag{6.3c}$$

$$\dot{\lambda}_2 = \lambda_2(\mu + \delta_h) - U_h + \lambda_1 p_h[+\tau_h + \theta(r + \delta_h - \pi) - \phi_h(J_h / h)^2]. \tag{6.3d}$$

Note that these first order conditions imply that c, h and m are strictly positive, otherwise they should be expressed in terms of Kuhn-Tucker conditions. At the steady state:

$$U_m^* / U_c^* = (\mu + \pi_c) \tag{6.4a}$$

$$U_h^* / U_c^* = v_1 p_h \tag{6.4b}$$

$$y = c^* + \pi_c m^* + v_2 p_h h^* \tag{6.4c}$$

where:

$$v_1 = (\mu + \delta_h + \tau_h) + \theta(r - \mu - \pi) + \phi_h \delta_h (2\mu + \delta_h)$$

$$v_2 = \delta_h (1 + \phi_h \delta_h) + \theta(r - \pi) + \tau_h.$$

Asterisk "*" denotes that the household is at an equilibrium. If utility is non-negative, v_1 must be positive. A sufficient but not necessary condition is that the real interest rate on mortgage loans measured in the property price is positive, that is:

$$r - \pi = r_h \geq 0.$$

Equation (6.4a) asserts that, at the steady state, the marginal utility of acquiring one more unit of liquidity is equal to the depreciation of money. Equation (6.4b) indicates that, at the steady state, the utility of holding one more unit of housing is equal to that of foregone consumption. The latter is equal to the sum of the depreciation, the interest and tax payments, and the adjustment cost of the property, minus the expected gain from the mortgage due to appreciation of property assets relative to non-durable goods. Since the household is bounded to borrow as long as it possesses non-zero property assets, it must be impatient at the prevailing interest rate, that is:

$$\mu - r_h = \mu + \pi - r \geq 0.$$

6.3.1.1 Housing as an Asset

λ_2 is the imputed value of housing. Its solution can be computed by using equation (6.3d):

$$\lambda_2 e^{-(\mu+\delta_h)t} = B_0 - \int_0^t \{U_h + U_c p_h[\phi_h(J_h / h)^2 + \theta(\pi - \delta_h - r) - \tau_h\} e^{-(\mu+\delta_h)s} ds. \quad (6.5a)$$

B_0 is a constant term, determined by an initial or a terminal condition. Since it is assumed h to be strictly positive, it must be true that:

$$\lim_{t\to\infty} \lambda_2 e^{-(\mu+\delta_h)t} = 0 \quad (6.5b)$$

Substituting (6.5b) into (6.5a) gives:

$$B_0 = \int_0^\infty \{U_h + U_c p_h[\phi_h(J_h / h)^2 + \theta(\pi - \delta_h - r) - \tau_h\} e^{-(\mu+\delta_h)s} ds. \quad (6.5c)$$

Substituting (6.5c) back into (6.5a) gives:

$$\lambda_2 e^{-(\mu+\delta_h)t} = \int_t^\infty \{U_h + U_c p_h[\phi_h(J_h / h)^2 + \theta(\pi - \delta_h - r) - \tau_h]\} e^{-(\mu+\delta_h)s} ds. \quad (6.5d)$$

Equation (6.5d) equates the discounted imputed value of housing at time t, $\lambda_2 e^{-(\mu+\delta_h)t}$, to the discounted utility of housing from time t to infinity. This illustrates that the value of housing can be expressed as that of a financial asset. On the right-hand side, U_h is the utility from housing services generated directly by occupying the dwelling. $U_c p_h \theta(\pi - \delta_h - r)$ is the utility from the consumption financed by the capital gain of the mortgage, net of the depreciation of the property and the interest payment of the mortgage. $\phi_h(J_h / h)^2$ is the reduction of the adjustment cost arisen from a larger housing stock. Lastly, τ_h is the reduction of consumption due to the property tax.

6.3.1.2 Comparative Static

To process further, it is necessary to specify the utility function in more details. Since non-durable goods, housing and liquidity are assumed to be essentials, it is reasonable and convenient to adopt a Cobb-Douglas utility function:

$$U(c,h,m) = B_1 c^{\alpha} h^{\beta} m^{1-\alpha-\beta}. \quad (6.6a)$$

Thereupon, it can be solved for the steady state demands for housing, non-durable goods and real money balance, respectively:

$$h^* = \beta y(1/p_h)/(v_1 v_3 + \beta v_2) \quad (6.6b)$$

$$c^* = \alpha y v_1 / (v_1 v_3 + \beta v_2) \quad (6.6c)$$

$$m^* = (1-\alpha-\beta) y [v_1 / (\mu + \pi_c)] / (v_1 v_3 + \beta v_2) \quad (6.6d)$$

where:

$$v_3 = [\alpha\mu + (1-\beta)\pi_c]/(\mu + \pi_c).$$

For simplicity, v_3 is assumed to be positive. The results of some comparative static exercises are given in Table 6.4.

Table 6.4: Results of Comparative Static

	Housing (h^*)	Non-durable goods (c^*)	Real money balance (m^*)
Mortgage to property value ratio (θ)	$r_h > 0$: ? $0 \geq r_h$: +	$r_h \geq 0$: – $0 > r_h$: ?	$r_h \geq 0$: – $0 > r_h$: ?
Disposable income (y)	+	+	+
Mortgage interest rate (r)	–	–	–
Relative property price (p_h)	–	0	0
Relative inflation of property (π)	+	+	+
Inflation of non-durable goods (π_c)	–	–	–
Property tax (τ_h)	–	–	–

Mortgage to Property Value Ratio

Surprisingly, a less restrictive mortgage limit, θ, does not necessarily raise housing demand. Instead, the outcome depends on the sign of r_h. Recall that the household is bounded to borrow by equation (6.2b) as long as it holds property assets. r_h is the interest rate on the mortgage measured in the property price and, thus, the real cost of property acquisition. If it is positive, a larger amount of borrowing will incur a higher real cost. On the other hand, easing the credit limit allows the household to purchase a bigger dwelling. Therefore, the overall impact on housing demand is ambiguous. If r_h is negative, purchasing real estate by mortgage loans, in effect, becomes a profitable investment. It thus definitely stimulates a greater demand for property, as a larger stock value of property will raise the total amount of borrowing.

The result hints that when there is a substantial property price plunge, simply relaxing the liquidity constraint faced by households, as the HKMA did during the Asian crisis, may not be effective to stabilize the real estate market. In particular, as the downturn of the Hong Kong property market was associated with interest rate hikes, the condition of $r_h > 0$ was likely to be valid.

The demand for non-durable goods changes in a different direction. If r_h is positive, the interest payment of the mortgage will reduce the amount of income that can be spent on non-durable goods. If r_h is negative, the mortgage becomes an interest bearing financial instrument, so the intertemporal substitution effect will induce the household to reduce consumption on non-durable goods and to invest more on property. On the other hand, a greater property stock and, thus, a larger mortgage will increase the current disposable income of the household. The income effect will lead to greater consumption of all goods. Consequently, the overall impact on the demand for non-durable goods is ambiguous. The same argument applies on real money balance.

Disposable Income

A higher disposable income, y, increases the consumption of all housing, non-durable goods, and real money balance, consistent with a general result that all commodities are normal goods under a Cobb-Douglas utility function.

Mortgage Interest Rate

Increasing the mortgage interest rate, r, will unambiguously lower the demand for housing, non-durable goods, and money balance. This is because, even if at the steady state, the household is bound to borrow. A higher interest rate will reduce the real income and, therefore, the consumption of all goods.

Property Price

A higher current property price, p_h, reduces the demand for housing as expected.

Nonetheless, it has no impact on the demand for non-durable goods and money balances. This is obviously the consequence of using a Cobb-Douglas utility function in that there is no cross price substitution.

Relative Inflation of Property

Unlike the current property price, an expected higher price of property relative to non-durable goods in the future, π, increases the demand for all commodities. This is because appreciation of property assets raises the value of existing property and thus the mortgage size. This boosts the income of the household immediately and, hence, the demand for all goods.

Inflation of Non-durable goods

Notice that when estimating the impact of non-durable goods inflation, π_c, it is implicitly assumed that the relative inflation of property is zero. So, it is indeed a case of general inflation. As a result, there is no means to hedge inflation. Nevertheless, general inflation will still erode the purchasing power of money. As a result, the household needs to reduce the consumption of all commodities.

Property Tax

A positive property tax reduces the demand for all commodities. This is simply because for every level of housing stock the household needs to pay a higher tax. The negative income effect gives rise to the outcome.

6.3.2 Property Developer

To complete the model this section specifies the supply side of the property market. The maximization problem of the property developer is as follows:

Maximizing $\int_0^\infty \Pi e^{-r_k t} dt$

subject to:

$$\Pi = p_h x - (wn + p_l l + I_k) \tag{6.7a}$$

$$F(n, k, l) = x \tag{6.7b}$$

$$I_k = p_k J_k[1+\phi_k(J_k / k)] \tag{6.7c}$$

$$\dot{k} = J_k - \delta_k k. \tag{6.7d}$$

The developer employs labor (n), capital (k) and land (l) to produce housing. The real gross profit or net cash flow (Π) is simply equal to the revenue ($p_h x$) minus the total non-capital cost, including factor rents ($wn+p_l l$) and investment expenditure (I_k). Π is indeed the total rental payment to capital. Thus, the economic profit of the developer is equal to zero, as expected in a competitive market. Since this is a partial equilibrium model, the labor wage (w) in the construction sector does not necessarily link to the income of the household. The current value Hamiltonian of the profit maximization problem is given as follows:

$$H_2 \equiv p_h x - wn - p_l l - p_k J_k[1+\phi_k(J_k / k)] + \lambda_3(J_k - \delta_k k).$$

Besides the original constraints, the other first order conditions are given as follows:

$$w / p = F_n \tag{6.8a}$$

$$p_l / p_h = F_l \tag{6.8b}$$

$$\lambda_3 = p_k[1+\phi_k(J_k / k)] \tag{6.8c}$$

$$\dot{\lambda}_3 = \lambda_3(\mu + \delta_k) - [p_h F_k + (\phi_k p_k)(J_k / k)^2] \tag{6.8d}$$

At equilibrium, equations (6.8a)-(6.8d) can be rewritten as:

$$w / F_n = p_l / F_l = (p_k / F_k^*)[(r_k + \delta_k) + \phi_k \delta_k (2r_k + \delta_k)] = p_h. \tag{6.8e}$$

Equation (6.8e) indicates that, for a profit maximizing developer, the marginal cost must be equal to the marginal output for each factor. For capital, the marginal cost consists of the depreciation, the time discounting factor, and the adjustment cost. If all factor prices are fixed, a higher property price relative to non-durable goods and, thus, to the labor wage and land price, will raise the supply of housing. Therefore, it can be written that:

$$x = x(p_h)\ ; x(.) > 0,\ x' > 0,\ x'' < 0. \tag{6.8f}$$

If the supply of housing investment goods is equal to the demand, it must be true that:

$$x(p_h) = J_h . \tag{6.8g}$$

6.3.2.1 Property Market Equilibrium

Substituting equation (6.8g) into (6.1c), and making use of π in equation (6.4b), it can obtain the two equations that determine the property market equilibrium:

$$\dot{h} = x(p_h) - \delta_h h . \tag{6.9a}$$

$$\dot{p}_h = -(1/\theta)\{(U_h^*/U_c^*) + p_h[(\mu + \delta_h + \tau_h) + \theta(r-\mu) + \phi_h\delta_h(2\mu + \delta_h)]\} . \tag{6.9b}$$

The two equations can be approximated by a linear matrix equation:

$$\begin{bmatrix} \dot{h} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} h - h^{**} \\ p - p^{**} \end{bmatrix} \tag{6.9c}$$

where:[16]

$$a_{11} = -\delta_h < 0$$

$$a_{12} = x_p > 0$$

$$a_{21} = (U_h^* U_{ch}^* - U_c^* U_{hh}^*) / [\theta(U_c^*)^2] > 0$$

$$a_{22} = (1/\theta)\{-[\partial(U_h^*/U_c^*)/\partial p_h] + [(\mu + \delta_h + \tau_h) + \theta(r-\mu) + \phi_h\delta_h(2\mu + \mu_h)]\} > 0 .$$

Double asterisks, "**", denotes that both the household and the property market are in the steady state, as distinguished from the steady state of the household only. It is straightforward to show that equation (6.9c) has one negative and one positive root. Hence, the steady state of the property market is a saddle point. When the property market is at equilibrium, $\dot{h} = \dot{p}_h = 0$. A plot of equation (6.9c) is given in Figure 6.5.

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[16] Note that the derivative of U_h/U_c with respect to p is positive.

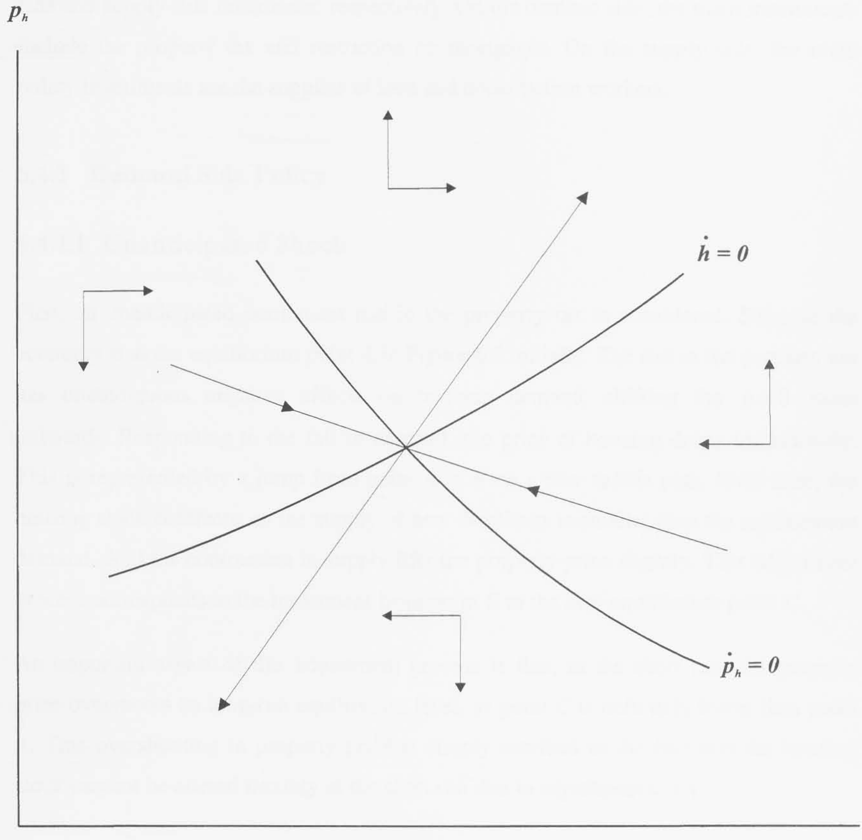

Figure 6.5: Phase Diagram for the Property Market

6.4 POLICY EXPERIMENTS

The policy options available to the authorities can be distinguished between demand side and supply side instrument, respectively. On the demand side, the main instruments include the property tax and restriction on mortgages. On the supply side, the main policy instruments are the supplies of land and construction workers.

6.4.1 Demand Side Policy

6.4.1.1 Unanticipated Shock

First, an unanticipated permanent rise in the property tax is considered. Suppose the economy is at the equilibrium point *A* in Figure 6.6 initially. The rise in the property tax has unambiguous negative effects on housing demand, shifting the $\dot{p}=0$ locus leftwards. Responding to the fall in demand, the price of housing drops immediately. This is represented by a jump from point *A* to *B* on a new saddle path. Over time, the housing stock contracts, as the supply of new dwellings is smaller than the replacement demand. And the contraction in supply lifts the property price slightly. This adjustment process corresponds to the movement from point *B* to the new equilibrium point *C*.

An important aspect of this adjustment process is that, in the short run, the property price overshoots its long-run equilibrium level, as point *C* is definitely lower than point *A*. This overshooting in property price is simply ascribed to the fact that the housing stock can not be altered flexibly in the short run due to adjustment costs.

Another type of demand side instruments are those targeting the means of financing property acquisition: mortgage interest rate and mortgage limit. While both are applied on the mortgage, targeting the price is more effective than targeting the quantity in terms of certainty. A higher mortgage interest rate, like a higher property tax, shifts the demand curve downward, and reduces the steady state housing stock and price. On the other side, as discussed previously, a quantitative control on the loan to value ratio can have either positive or negative effects on housing demand. Therefore, the demand curve may shift up as well as down. Nevertheless, in all the cases of unanticipated demand shocks, the overshooting story described above still applies.

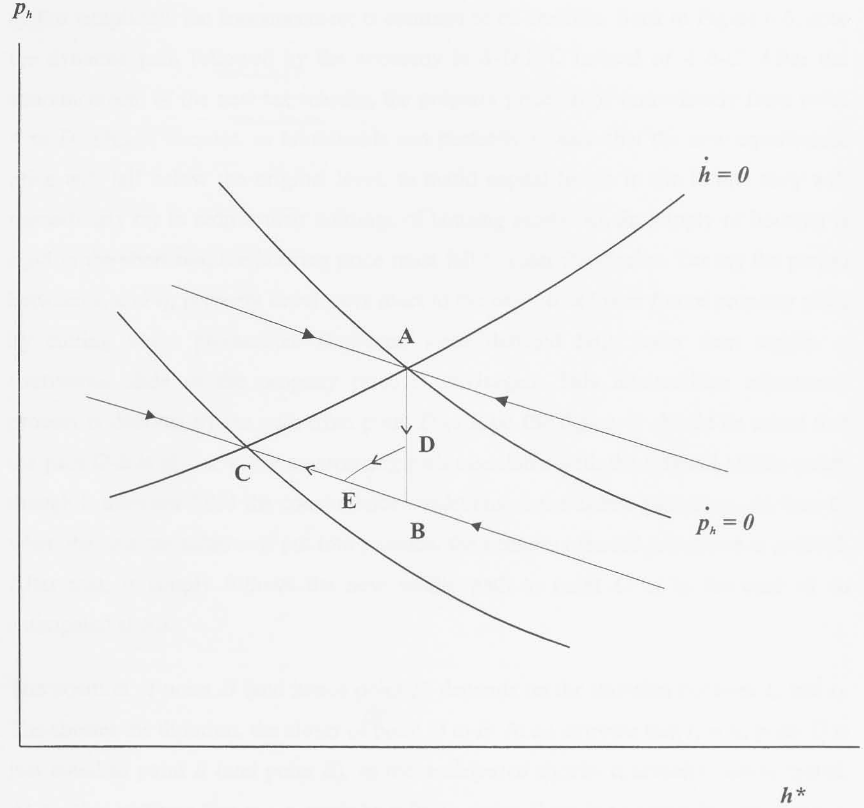

Figure 6.6: Impacts of a Negative Demand Shock on the Property Market

6.4.1.2 Anticipated Shock

Now consider an anticipated demand shock. Suppose the authority announces at time t_0 a permanent increase in the property tax that will become effective at time t_1, where $t_1 > t_0$. For simplicity, the announcement is assumed to be credible. Back to Figure 6.6, now the dynamic path followed by the economy is *A-D-E-C* instead of *A-B-C*. After the announcement of the new tax scheme, the property price drops immediately from point *A* to *D*. This is because, as households can perfectly foresee that the new equilibrium price will fall below the original level, to avoid capital losses in the future, they will immediately try to reduce their holdings of housing assets. As the supply of housing is rigid in the short run, the housing price must fall to clear the market. During the period between t_0 and t_1, property developers react to the news of a lower future property price by cutting down production. However, since demand falls faster than supply, a continuous slide of the property price is envisaged. This intermediate adjustment process is denoted by the path from point *D* to *E* on the figure. It should be noted that the path *D-E* is also a utility maximizing path associated with the original saddle point, though it does not fulfil the convergence conditions as the saddle path does. At time t_1, when the new tax scheme is put into practice, the economy should just arrive at point *E*. After that, it simply follows the new saddle path to point *C* as in the case of an anticipated shock.

The position of point *D* (and hence point *E*) depends on the duration between t_0 and t_1. The shorter the duration, the closer of point *D* to *B*. At an extreme that $t_1 = t_0$, point *D* is just equal to point *B* (and point *E*), as the *anticipated* shocks is actually unanticipated. At another extreme that $t_1 - t_0$ tends to infinity, point *D* tends to coincide with point *A*, and so is *D-E* with the $\dot{h} = 0$ locus. That is, the economy will tend to take infinite time to reach point *C*.

Since point *E* is always below point *C*, the property price still overshoots its long run equilibrium level. Nonetheless, compared to the case of unanticipated shocks, the overshooting is dampened. The intuition is simple, by announcing the tax scheme earlier, the authority essentially gives the private sector time to carry out part of the needed adjustment before the policy is actually put in place.

6.4.2 Supply Side Policy

6.4.2.1 Unanticipated Shock

If there is little substitution between land, labor and capital inputs, any decrease in the supply of land or construction labor will reduce the steady state housing stock at all price levels. In Figure 6.7, this is represented by a leftward shift of the $\dot{h} = 0$ locus. The spontaneous impact is a rise in housing price, as indicated by a jump from point *A* to point *B* in the figure. Over time the housing stock falls as the replacement demand is smaller than the supply of new housing units. The economy moves from point *B* along the new saddle path to the new equilibrium point *C*. In contrast to the case of demand shocks, the housing price does not overshoot its equilibrium level, as point *C* is clearly above points *B* and *A*.

6.4.2.2 Anticipated Shock

Again, the authority announces at time t_0 a permanent reduction of land disposal that will become effective at time t_1, with $t_1 > t_0$. Now the adjustment path is *A-D-E-C* instead of *A-B-C*. At time t_0, when the policy is announced, the property price jumps instantaneously from point *A* to *D*. This is because, as agents expect a higher property price in the future, it is profitable to increase property asset holdings. With an inelastic supply of housing, the property price goes up in response to a greater demand. From time t_0 to t_1, demand continues to rise. This keeps pushing up the property price. A higher price, in turn, induces property developers to deploy more resources in housing construction. The housing stock increases as the supply of new housing units is larger than the replacement demand. This intermediate adjustment is denoted by the section *D-E* on the diagram.

An important aspect of this adjustment process is that housing stock actually expands in the medium run. At time t_1, when the policy comes into effect, the supply of newly finished housing units starts to reduce. This gradually cut into existing housing stock. Eventually, housing stock diminishes to below the original level. In the figure, this is represented by moving from point *E* to *B* and further to point *A*.

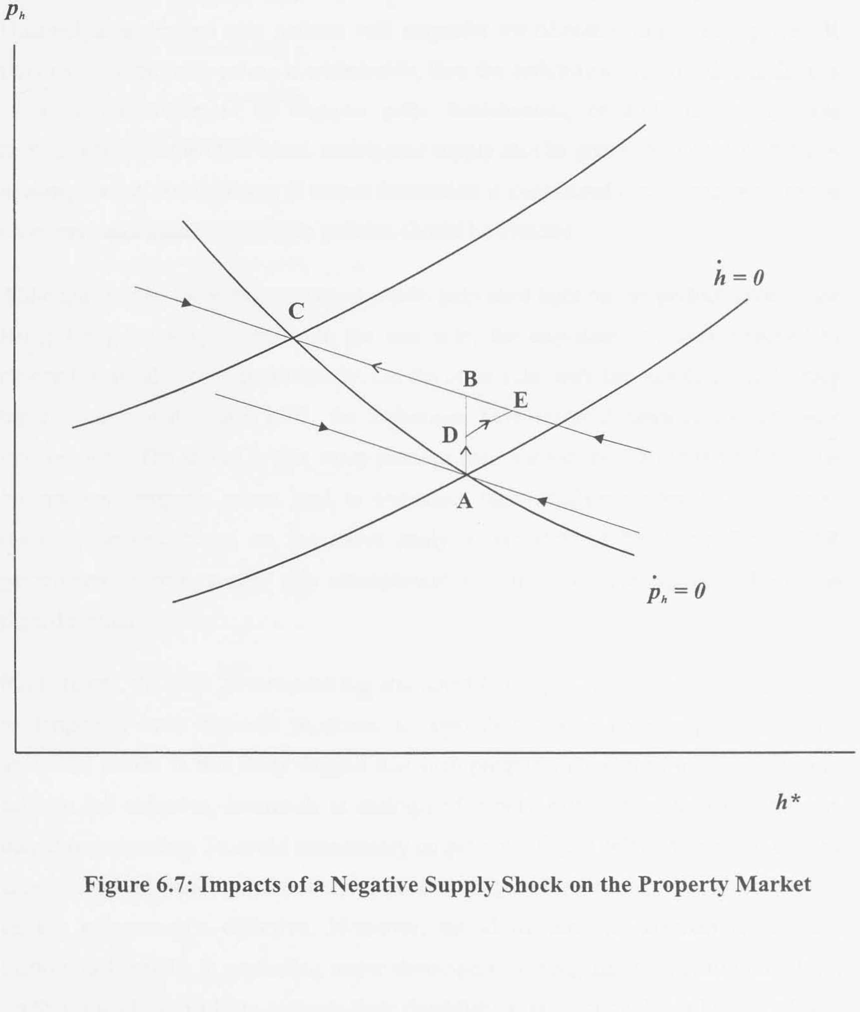

Figure 6.7: Impacts of a Negative Supply Shock on the Property Market

6.4.3 Policy Implications

The above experiments clearly indicate that, the preferred policy to manage the property market depends on the policy objective and whether the policy is pre-announced. Unanticipated demand side policies will engender overshooting in property prices. If fluctuation in property prices is undesirable, then the authorities should either make use of a pre-announcement to dampen price overshooting or shift to supply side management. On the other hand, anticipated supply shocks give rise to overshooting in housing output. Accordingly, if output fluctuation is considered disadvantageous to the economy, anticipated supply side policies should be avoided.

Although simple, the above analytical results help shed light on the performance of the Hong Kong property market. On the one side, the city-state has been exposed to external demand shocks continuously. On the other side, with the supply of land being highly constrained before 1997, the authorities have resorted more to demand side interventions. The model in this study predicts that, without enough time to digest the information, property prices tend to overshoot their equilibrium levels when news suddenly arrives. Based on the above analysis, the shift of the Hong Kong SAR government more to supply side management after the hand-over seems to be in the right direction.

Furthermore, the SAR government has attempted to use pre-announcement of medium- to long-term land disposal programs to smooth property price expectation. The analytical results in this study suggest that such programs alone may not be enough to achieve the objective, inasmuch as anticipated supply side shocks actually envisage output overshooting. To avoid unnecessary output volatility, it will be warranted to have more stable and even land disposal plans over a longer time horizon. That also seems to be the government's objective. Moreover, the above analyses abstract from many institutional details. In particular, major developers in Hong Kong normally have built up their own land banks to enhance their flexibility in production. Such buffers of land supply may render output overshooting less significant in practice.

Last, but not least, as mentioned in Section 6.2, after the Asian crisis, the Hong Kong government put forward an application system in which developers can nominate (with a price offer) any listed land sites for sales. This system allows the market to partly determine the quantity of land disposed. Effectively this provides a channel to substitute quantity fluctuation for price fluctuation. Notwithstanding, the authorities still maintain the discretionary power to veto an application or simply to not put up enough sites for application. Therefore, the system is 'biased' in the sense that it can avoid excess-supply but not under-supply of land.

6.5 CONCLUSIONS

Property markets have enormous significance for the Hong Kong economy. This is reflected in the fact that property related activities dominate a lot of economic areas in Hong Kong, such as loan making, employment, government revenues, and the national output. Furthermore, the city-state has virtually no natural endowments other than land resources, which are almost completely monopolized by the government. Thus, delivering appropriate land and housing policies becomes extremely important for both social and economic considerations. Nevertheless, the authorities are confronted with many challenges as well as constraints. The population is growing at a fast pace, partly due to massive Chinese migration. In spite of continuous effort to develop more utilizable land, land is still a scarce resource in per capita terms. At the same time, the interest rate instrument has been surrendered under the currency board arrangement, limiting the demand side management capacity of the authorities. As a result, the pressure on the supply side management has been mounting. It can be foreseen that housing will continue to be a key problem for Hong Kong in the future.

The partial equilibrium model developed in this chapter shows that property taxes, and the supply of land and labor all have unambiguous impacts on housing prices and quantities. Nonetheless, unanticipated demand side policies can lead to overshooting in property prices, and anticipated supply side policies lead to overshooting in housing outputs. The effectiveness of quantitative controls on mortgage loans is conditional on the interest rate and property inflation. The interest rate on mortgage loans, on the other hand, has more precise effects on the property market. However, even if under a flexible exchange rate regime, unless mortgage loan rates can be separated from other interest rates, that is there is credit market segregation, the interest rate instrument can not be assigned solely to maintain the stability of property markets. An essential question arising from this is whether the business cycle of property markets necessarily coincides with that of the wider economy. This question is centrally about the general equilibrium relationship between property markets and the rest of the economy. The next chapter is devoted to this question.

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Appendix 6

Table 6.A1: Definitions of Notations (in alphabetical order)

Symbol	Definition and Notes
c	real consumption of non-durable
F	production function
H	real consumption of housing services
I_h	real investment on housing
I_k	real investment on physical capital
J_h	fixed formation of housing capital
J_k	fixed formation of physical capital
k	real capital input
l	real land input
m	real money balance
n	real labor input
p_h	relative price of housing in terms of non-durable goods
p_k	relative price of capital goods in terms of non-durable goods
p_l	relative price of land in terms of non-durable goods
r	real interest rate of mortgage
$r_h = r - \pi$	real interest rate of mortgage measured in property price
r_k	real interest rate faced by property developer
U	instantaneous utility function: $U_c, U_h, U_m > 0; U_{cc}, U_{hh}, U_{mm} < 0$
x	supply flow of housing per unit time
y	disposable real income
z	real mortgage
Π	gross real profit or real net cash flow
$\pi_c = \dot{P}_c / P_c$	inflation of non-durable measured in nominal price
$\pi_h = \dot{P}_h / P_h$	inflation of housing measured in nominal price
$\pi = \pi_h - \pi_c$	relative inflation of housing to non-durable
ϕ_h	adjustment cost coefficient of housing
ϕ_k	adjustment cost coefficient of physical capital
δ_h	deprecation rate of housing of housing
δ_k	deprecation rate of housing of physical capital

CHAPTER 7

Property Markets & Exchange Rate Arrangement

Part II

Synopsis 7

This chapter presents an intertemporal general equilibrium model to study the interaction between property markets and the wider economy in an open macroeconomic context. To resemble the Hong Kong economy, the model emphasizes the coexistence of multiple real estate markets and the government's role in property markets. It is found that non-tradability, durability and adjustment costs give rise to the unique position of real estate in the economy. A resource boom in the construction sector can lead to a completely opposite result to that in the tradable non-durable manufacturing sector. Secondly, due to the adjustment costs in the accumulation of housing capital, the real impacts of monetary changes on property markets are more prolonged than those on non-durable sectors. As a result, a fixed exchange rate regime exacerbates the business cycles in property markets and the economy as a whole. Likewise, simulation results show that, the attempt by the Hong Kong government to stabilize property prices during the Asian crisis, by suspending land disposal, might have come at the cost of further aggravating the impacts of the crisis and retarding economic recovery.

7.1 INTRODUCTION

This chapter is a continuation of the last one. While the partial equilibrium model presented in the last chapter is useful to illustrate some basic economic characters of property markets, falls short of capturing the institutional features of the Hong Kong property market. The capacity of the model is also limited, inasmuch as it abstracts from all open economy elements.

The objective of this chapter is to investigate exchange rate arrangement issues by extending the previous model into a better-equipped one. Firstly, the model is developed from a partial into a general equilibrium model, with three different industries and three real estate markets. Secondly, government interventions in real estate markets are fully acknowledged. Thirdly, the model is constructed under an open economy framework, with a range of nominal rigidity and exchange rate arrangement options.

Three sets of simulation experiments are conducted under four different regimes to capture various effects of property markets. They correspond respectively to a change of monetary policy, a change of land policy, and a reevaluation of financial risk in the domestic economy. While the exercise is primarily for theoretical purposes, the structure of the model roughly resembles the economic structure of Hong Kong, and the simulations by and large relate to recent events or policy innovations in the territory.

The remainder of the chapter is organized as follows. The next section provides a brief review of the literature and a non-technical preview of the model; Section 3 explains the mathematical details of the model; Section 4 discusses the results of simulations; and Section 5 concludes the chapter.

7.2 REVIEW AND PREVIEW OF HOUSING MODELS

Early studies of housing and real estate are rooted deeply in neoclassical consumer theory. Housing is considered to be a durable good. Households and real estate developers are assumed to maximize their one period utility and profits, respectively. Examples include McDonald (1979), Friedman and Weinberg (1982) and Maclennan

(1982). Later studies, following the mainstream development in economic theories, emphasize the intertemporal feature of economic decisions. One of the earliest attempts of this kind is Hammond (1987). Contemporary studies of this topic further integrate with capital theory, capturing the nature of real estate as both a durable good and a physical asset, for example Okumura (1997) and Miles (1994). Incorporating the asset nature of real estate significantly enriches the dynamics of the property market. Similar to its role in other asset markets, expectation becomes crucial. The partial equilibrium model presented in the last chapter is a typical example of this type of model.

Studies like Okumura (1997) and Miles (1994) are still basically confined within the microeconomic framework, in the sense that a number of crucial macroeconomic variables are set to be exogenous, such as wages, interest rates, and inflation. As a result, the equilibrium of the housing market is determined separately from, rather than in conjunction with, other markets.

This general equilibrium framework has been increasingly embraced. Recent examples include Turnovsky and Okuyama (1994) and Nielsen and Sorensen (1994). However, both studies ignore the supply side constraint of land, as well as a number of macroeconomic factors, such as capital adjustment costs, the external balance, and the role of money. A multi-country model constructed by McKibbin and Wilcoxen (1995), the G-Cubed model, has incorporated consumer durable goods and residential housing. Nevertheless, in the current version of the model the supplies of natural resources, including land, are assumed perfectly elastic. The model also abstracts from commercial building. More importantly, the linkage between property markets and the balance of payments is largely overlooked in most studies. Two noticeable exceptions are Morande (1992) and Matsuyama (1990). The former establishes the linkage between current account balance and property prices empirically, while the latter does it theoretically. Notwithstanding, both studies do not account for the role of the exchange rate regime. Moreover, Morande (1992) focuses solely on residential property, whereas Matsuyama (1990) neglects the role of land supply.

On the other side, if one widens the scope from housing specifically to more generally non-tradable (durable or non-durable) goods, there will be no supply shortage of general equilibrium analyzes. For example, see Rebelo (1997), van Winccop (1993), and the citations in their papers. In terms of model structure, these two papers share some similarities with this study, although this study is differentiated from them, and all other papers cited previously, by its much more detailed treatment of property markets.

Table 7.1: Structure of the Model

Country:	**Factors:**
Single small open economy	Physical capital (imported)
Agents:	Labor (mobile across sectors)
Household	Sector-specific factors (including land)
Government	**Housings:**
Industries:	Commercial building
Manufacturing (tradable, non-durable)	Residential housing:
Servicing (non-tradable, non-durable)	*Public-subsidized housing*
Construction (non-tradable, durable)	*Private-funded housing*

This chapter attempts to integrate property markets into an intertemporal general equilibrium model, with a rational expectation representative agent for each sector of the economy.[1] The basic framework of the model is a combination of two workhorses in economics: the Salter (1959) and the Ramsey (1928) model.

As summarized in Table 7.1, the model is constructed with five agents: three production sectors, a representative household, and a government. The three industries correspond to tradable non-durable manufacturing goods, non-tradable non-durable services, and non-tradable durable housing. Highlighting the coexistence of various real estate markets in an economy, the model distinguishes between commercial building, private-funded residential housing, and public-subsidized residential housing (the last two hereafter are abbreviated as private housing and public housing, respectively). The purpose of incorporating public housing in the model is to capture the fact that half the population in Hong Kong inhabits various forms of public-subsidized dwellings. It also

[1] See Hartley (1997) for an extensive and strong criticism of this type of representative agent model, along with rational expectation.

provides a platform to examine how public housing policies influence the private housing market.

Each industry uses primary factors, intermediate goods, commercial building, and a sector-specific factor for production. One of the functions of incorporating sector-specific factors is to stabilize the model and thus facilitate numerical iteration. In the construction sector, the specific factor is land. The inclusion of commercial building into the production implies the potential influence of property prices on export competitiveness. Physical capital is wholly imported from overseas, reflecting the situation that Hong Kong has virtually no heavy manufacturing industries. Intermediate goods include manufacturing goods and services. A function of incorporating these two intermediates into the production is to maintain the symmetry between the industries such that dissimilarities in inter-sectoral comparison can be easily highlighted. Another purpose is to enhance the interdependence between industries, which is crucial in the propagation of shocks.

The household provides labor and capital services to the three industries in return for wages and interest. The household consumes residential housing, and non-durable goods, as well as leisure. Residential housing comprises private and public housing. For simplicity, the distinction between renting and purchasing is ignored. All housing is assumed to be sold. Due to government subsidy, public housing is sold at lower than market price. In recent years, the Hong Kong government has strongly encouraged public housing tenants to purchase their rented units from the authorities.

The government budget is balanced in every period. This is consistent with the fact that the Hong Kong government does not issue any debts. Government expenditure is financed by a lump sum tax on the household and sales of specific factors to industry. Nonetheless, government still has a crucial role. It controls the supply of land, and the distribution of land disposal amongst the three types of real estate, as well as the level of subsidy on public housing. It should be pointed out that, while the government is the sole supplier of land in the model, monopolistic behavior in the real estate market is not considered here.

The model consists of only one country; the rest of the world is treated as exogenous. Capital is perfectly mobile internationally. The home country is a small trader in the world market, so the prices of capital investment goods and manufacturing goods are set exogenously. Two constraints are imposed to avoid either infinite borrowing from or infinite lending to the rest of the world. Firstly, the domestic subjective discount rate is set equal to the world interest rate. Secondly, the domestic interest rate is equal to the world interest rate plus a risk premium, which is a function of the ratio of the serving of foreign debt to GDP. Together these two constraints imply that, at the steady state, the amount of foreign debt must be equal to zero.[2]

The model incurs three sources of rigidity. Firstly, real rigidity arises from the adjustment costs of physical capital and housing accumulations. Secondly, the risk premium in the uncovered interest parity condition incurs real rigidity in foreign asset accumulation. Lastly, nominal rigidity comes from an error correction process of nominal wage adjustment. The role of money in the economy is modeled via a money-in-the-utility-function approach. The setting of nominal rigidity is crucial as it gives money and hence the exchange rate regime real effects. Thereby, the labor market does not clear continuously, but labor is perfectly mobile across sectors. The last two sources of rigidity are imposed upon the model to ensure that it functions *properly*. Though somewhat arbitrary, they are conceptually appealing, empirically relevant and practically simple. Lastly, no deterministic growth trend is imposed on the economy. In other words, if there is no disturbance, the economy will be at a stationary equilibrium.

The next section describes the structure of the model formally. The notation is listed in Table 7.A1 in Appendix 7.

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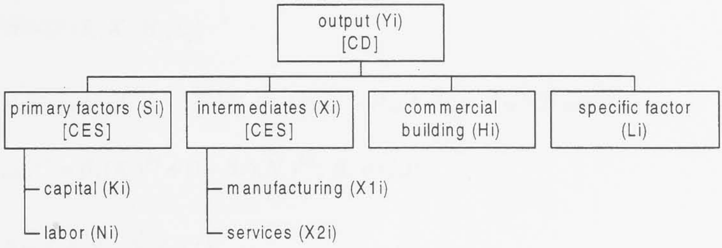
[2] One can change the amount of foreign debt at the steady state by allowing a discrepancy between the domestic subjective discount rate and the world interest rate.

7.3 GENERAL EQUILIBRIUM MODEL OF PROPERTY MARKETS

7.3.1 Industries

The objective of firms is to maximize a stream of discounted current and future real gross profit. Production in each sector involves two primary factors, two intermediate inputs, and commercial building, as well as a sector-specific factor. The production nesting is illustrated in Figure 7.1.

Figure 7.1: Production Nesting



The upper level of the production nesting is in the Cobb-Douglas form. In the lower level, the primary factor S_i is composed of physical capital and labor through a constant-elasticity-of-substitution (CES) function. Indeed, this is the basic structure of the model: commodities without cross price substitutability are nested by a Cobb-Douglas function, and commodities with cross price substitutability are nested by a CES function. The model abstracts from the role of infrastructure in transforming natural land into usable land. Alternatively, one can consider the infrastructure is embodied in the construction of housing. For simplicity, the factor intensities of the three industries are set to be the same.

Formally, the objective of firm i is to:

$$\text{maximize} \int_0^\infty \Pi_i e^{-Rt} dt$$

subject to:

$$\Pi_i = (P_i / P)Y_i - (P_K / P)I_{Ki} - (P_H / P)I_{Hi} - (W / P)N_i$$

$$-(P_{Xi} / P)X_i - (P_{Li} / P)L_i \qquad (7.1a)$$

$$I_{Ki} = J_{Ki}[1 + (\phi_K / 2)(J_{Ki} / K_i)] \qquad (7.1b)$$

$$\dot{K}_i = J_{Ki} - \delta_K K_{Ki} \qquad (7.1c)$$

$$I_{Hi} = J_{Hi}[1 + (\phi_H / 2)(J_{Hi} / H_i)] \qquad (7.1d)$$

$$\dot{H}_i = J_{Hi} - \delta_H H_i; \qquad (7.1e)$$

where:

$$Yi = Q^i(S_i, X_i, H_i, L_i) \qquad (7.1f)$$

$$Q^i = \beta_{31}(S_i)^{\beta 32}(X_i)^{\beta 33}(H_i)^{\beta 34}(L_i)^{\beta 35};\ \beta_{32} + \beta_{33} + \beta_{34} + \beta_{35} = 1 \qquad (7.1g)$$

$$(S_i)^{\beta 6} = \beta_5(K_i)^{\beta 6} + (1 - \beta_5)(N_i)^{\beta 6};\ \beta_6 \in (0,1) \qquad (7.1h)$$

$$P = \sum_{i=1}^{3} P_i(Y_i - \sum_{j=1}^{3} X_{ij}) / Y \qquad (7.1i)$$

$$Y = \sum_{i=1}^{3} P_{i,t=0}(Y_i - \sum_{j=1}^{3} X_{ij}). \qquad (7.1j)$$

Equation (7.1a) indicates that the net cash flow (Π_i) of firm i is equal to the value of output (Y_i) minus the costs of factors (K_i, N_i, and L_i) and intermediates (X_i). Π_i is the real gross profit that is paid to the capital-owner (i.e. the household) instead of the economic profit. Sector-specific factors (L_i) can be considered as natural resources. Their supplies are controlled by the government. Profit tax is ignored, as it is irrelevant to the study. Since labor (N_i) is perfectly mobile, wages (W) are equalized across sectors. All the relative prices are measured in terms of the GDP deflator (P). Y is GDP, and X_{ij} is the amount of output from industry i being used as intermediate inputs in industry j.[3]

Equations (7.1b) and (7.1c) describe the formation of physical capital (K_i). The formation of capital is subject to an adjustment cost as a standard setting since Lucas (1967), Uzawa (1968), and Treadway (1969). Equations (7.1d) and (7.1e) determine the formation of housing capital (H_i), which is used as an input in each industry. The formation of housing capital is also subject to an adjustment cost, similar to physical capital. Equations (7.1f)-(7.1h) describe the production technology as illustrated in Figure 7.1.

$R(s)$ is the average of the short-term interest rate, $r(t)$, over time s and t, defined as:

$$R(s) = \frac{1}{(s-t)} \int_t^s r(v) dv .$$

The current value Hamiltonian of the maximization problem for the firm i is given as:

$$\begin{aligned} h_i \equiv\ & (P_i / P) Q^i (K_i, N_i, X_i, H_i, L_i) - (P_K / P) I_{Ki} - (P_H / P) I_{Hi} - (W / P) N_i \\ & -(P_{Xi} / P) X_i - (P_{Li} / P) L_i \\ & +\lambda_{JKi} \{ I_{Ki} - J_{Ki} [1 + (\phi_K / 2)(J_{Ki} / K_i)] \} \\ & +\lambda_{JHi} \{ I_{Hi} - J_{Hi} [1 + (\phi_H / 2)(J_{Hi} / H_i)] \} \\ & +\lambda_{Ki} (J_{Ki} - \delta_K K_i) \\ & +\lambda_{Hi} (J_{Hi} - \delta_H H_i) . \end{aligned}$$

Besides the original constraints, other first order conditions of the maximizing problem are given by:

$$J_{Ki} = (q_{Ki} - 1)(K_i / \phi_K) \tag{7.2a}$$

[3] Note that $X_{3j} = 0$ for all j.

$$J_{Hi} = (q_{Hi} - 1)(H_i / \phi_H) \tag{7.2b}$$

$$q_{Ki} = \lambda_{Ki} P / P_K \tag{7.2c}$$

$$q_{Hi} = \lambda_{Hi} P / P_H \tag{7.2d}$$

$$W = P_i Q^i_{Ni} \tag{7.2e}$$

$$P_{Xi} = P_i Q^i_{Xi} \tag{7.2f}$$

$$P_{Li} = P_i Q^i_{Li} \tag{7.2g}$$

$$\dot{\lambda}_{Ki} = (r^* + \delta_K)\lambda_{Ki} - (P_i / P)Q^i_{Ki} - (P_K / P)(\phi_K / 2)(J_{Ki} / K_{Ki})^2 \tag{7.2h}$$

$$\dot{\lambda}_{Hi} = (r^* + \delta_H)\lambda_{Hi} - (P_i / P)Q^i_{Hi} - (P_H / P)(\phi_H / 2)(J_{Hi} / H_i)^2 . \tag{7.2i}$$

Equations (7.2a) to (7.2b) govern the formation of physical capital and commercial building. λ_{Ki} and λ_{Hi} are the increment to the value of firm i from accumulating one more unit of physical capital and commercial building stocks, respectively. So, equations (7.2c) and (7.2d) define the marginal Tobin's q of physical capital and commercial building, respectively. Tobin's q conveys the information about the profitability of investment. As pinned down by equations (7.2a) and (7.2b), it is profitable to further invest as long as Tobin's q is greater than one. Equations (7.2e) to (7.2g) state that the deployment of any factor is up to the point that its marginal benefit is equal to its marginal cost. Dynamic equations (7.2h) and (7.2i) remark that each capital is accumulated up to where the marginal cost equates to the marginal benefit. The former is equal to the interest rate plus the depreciation rate, while the latter is equal to the rise in output plus the fall in the adjustment cost, due to a larger capital stock.

X_i is an aggregate intermediate good, composed of manufacturing goods and services. The proportion of the two goods in X_i is determined by a second-tier optimization process as follows:

maximize X_i

subject to:

$$(X_i)^{\beta 12} = \beta_{11}(X_{1i})^{\beta 12} + (1-\beta_{11})(X_{2i})^{\beta 12} \;;\; \beta_{12} \in (0,1]$$

$$P_{Xi}X_i = P_1 X_{1i} + P_2 X_{2i}$$

where:

$$(P_{Xi})^{1-\sigma 12} = \beta_{11}{}^{\sigma 12}(P_1)^{1-\sigma 12} + (1-\beta_{11})^{\sigma 12}(P_2)^{1-\sigma 12} \;;\; \sigma_{12} = 1/(1-\beta_{12}).$$

Solving the problem, it can be obtained:

$$X_{1i} = X_i[\beta_{11}(P_{Xi} / P_1)]^{\sigma 12} \tag{7.3a}$$

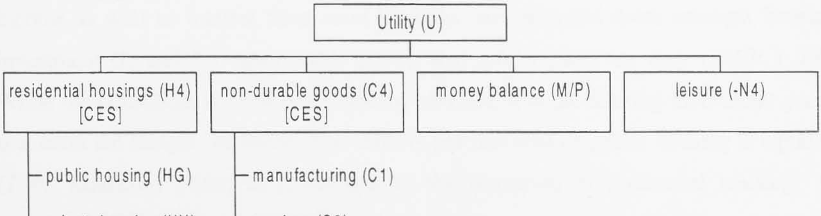
$$X_{2i} = X_i[(1-\beta_{11})(P_{Xi} / P_2)]^{\sigma 12}. \tag{7.3b}$$

Equations (7.3a) and (7.3b) state that the demand for goods j, $j = 1$ *or* 2, is negatively proportional to the ratio between its price P_j and the intermediate input price index P_{Xi}.

7.3.2 Household

The household is treated as the fourth sector in this model. The household maximizes utility from consuming services from residential housing, non-durable consumer goods, leisure, and liquidity. The consumption nesting is illustrated in Figure 7.2. The first level is in the Cobb-Douglas form, and the second in the CES form. Residential housing comprises private and public housing. Similar to the intermediate input in production, the non-durable consumer good (C_4) comprises manufacturing goods and services.

Figure 7.2: Consumption Nesting



Formally, the optimization problem of the household is stated as:

$$\text{maximizing } \int_0^{\infty} U(H_4, C_4, M/P, N_4)\, e^{-\mu t} dt$$

subject to:

$$(W/P)N_4 + r(A - M/P) =$$

$$(P_V/P)I_V + \theta(P_G/P)I_G + (P_4/P)C_4 + \dot{A} + \pi(M/P) + TX \tag{7.4a}$$

$$I_V = J_{HV}[1 + (\phi_H/2)(J_{HV}/H_V)] \tag{7.4b}$$

$$\dot{H}_V = J_{HV} - \delta_H H_V \tag{7.4c}$$

$$I_G = J_{HG}[1 + (\phi_H/2)(J_{HG}/H_G)] \tag{7.4d}$$

$$\dot{H}_G = J_{HG} - \delta_H H_G \tag{7.4e}$$

$$(H_4)^{\beta 2} = \beta_1 (H_V)^{\beta 2} + (1 - \beta_1)(H_G)^{\beta 2} \tag{7.4f}$$

$$N_4 = \sum_{i=1}^{3} N_i \,, \tag{7.4g}$$

where:

$$U(H_4, C_4, M/P, N_4) = \beta_{20}[(H_4)^{\beta 21}(C_4)^{1-\beta 22}]^{\beta 23}(M/P)^{1-\beta 23} - \beta_{24}(N_4)^{\beta 25} \tag{7.4h}$$

$$A = \sum_{i=1}^{3}(q_{Ki}K_i + q_{Hi}H_i) + A^* + M/P. \tag{7.4i}$$

Equation (7.4a) is the budget constraint of the household. The household earns labor income as well as interest from asset holdings, and allocates them amongst housing investment (I_V and I_G), non-durable goods, savings ($\dot{A}$), and tax duty ($\pi M/P$ + TX). While the household is consuming housing services, it is the housing investment goods that enter the budget constraint. The subsidy per unit cost of public housing is equal to $(1-\theta)$. Equations (7.4b) to (7.4e) specify the formation of residential housing. As expressed in equations (7.4c), (7.4e) as well as (7.1e), housing investments are partially absorbed by the replacement of depreciated housing. For simplicity, the possibility of redevelopment on the land of existing dwellings by private developers is excluded. In other words, depreciated buildings are demolished, and the recovered land is returned to the government rather than to property owners. This is consistent with the fact that almost all land in Hong Kong is leasehold rather than freehold land (see Chapter 6).

An additive separable utility function is used to simplify the interaction between the consumption of commodities and leisure (equation 7.4h). The household's financial possessions (A) consist of domestic asset ($q_{ki}K_i$ and $q_{Hi}H_i$),[4] foreign asset (A^*) and real money balance (M/P). Following McKibbin and Sachs (1991), it is assumed the household is holding claims against the physical and housing capital of firms (equation 7.4i), rather than holding claims against firms' financial liabilities, that is, securities. However, with a perfect capital market, the two treatments are equivalent.[5] As mentioned previously, the rental payment of capital to the household is just equal to the net cash flow of corresponding firm (Π_i).

The role of money in the model deserves a little more discussion. This is because the primary concern of this chapter is the influence of the exchange rate regime on property markets. Mechanically the difference between flexible and fixed exchange rate regimes is the amount of money supplied (Argy, McKibbin et al. 1989). And the effect of changing money supply hangs on the way money and nominal rigidity is being modeled. The issue of nominal rigidity is discussed in Section 7.3.5. Money is incorporated into the model via the money-in-the-utility-function approach popularized by Sidrauski (1967) and Brock (1975). The underlying rationale of this approach is that money provides liquidity for transaction and therefore engenders utility. There are a number of competing theories about how to incorporate money into economic models. Other widely adopted approaches include the cash-in-advance approach in Clower (1967) and Lucas (1980), the shopping-time approach in Saving (1971) and Kimbrough

[4] The value of a financial asset is equal to Tobin's average q times the capital stock. Therefore, here it is required the equivalence of Tobin's average q and Tobin's marginal q to hold (Hayashi 1982).

[5] For an example of explicit treatment of commercial securities and bonds in an intertemporal general equilibrium model, see Turnovsky (1996).

(1986), and the transaction-costs approach in Rebelo (1997).[6] Nonetheless, there is increasing research that shows under certain conditions, such as complementarity of the utility function, equivalent results can be obtained from different approaches (Feenstra 1986; Wang and Yip 1992; Croushore 1993).[7]

As described above, what the agents purchase are housing investment goods rather than ready-to-use housing capital. The investment goods then accumulate into housing stocks subject to adjustment costs. As a result, the adjustment process is virtually the final part of the production process, but is carried out by the users rather than by the construction sector. The same specification is also used in the accumulation of physical capital. This specification requires further justification.

In the case of physical capital, the adjustment cost is commonly explained as installation cost. In the case of housing, the nature of the adjustment cost is slightly more complicated. From the disposal of land to the completion of a building, there is a prolonged construction period. Secondly, there is a time gap between the completion of a building and actual utilization, due to the transaction costs involved in mortgage arrangements, moving, and decorating (Harmon and Potepan 1988). While the former type of delay comes from the production side, and the latter from the consumption side, both can be modeled by adjustment costs. To simplify the model, the two adjustment costs are grouped into one on the consumption side. The major benefit in doing this is to simplify the simulation program substantially by maintaining the symmetry between the settings of the three industries.

One would probably expect the adjustment cost on the production side to be much larger than that on the consumption side. As a result, the price of housing investment goods is not a good indicator of the actual or effective property price. A simple, though

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[6] An uncommon money-in-the-production-function approach is used in McKibbin (1986). Under this approach, liquidity lubricates production rather than consumption. Assuming the production function a CES nesting of primary factors and real money balance, the derived function of money balance virtually resembles the Keynesian money demand function.

[7] Yet none of these approaches are immunized from the criticism of Wallace (1998) that monetary theories should not presume the necessity or superiority of using fiat money in exchange. He asserts that monetary theories should "specify both the physical environment and the equilibrium concept of the model in a way that does not rely on the concept called *money* or force the modeler at the outset to specify which objects will play a special role in trade" (Italic original).

imperfect, way to remedy this problem is to include adjustment costs in the measures of property prices. Formally, the effective property prices are defined as:

$$P_{Hi} = P_H[1+(\phi_H/2)(J_{Hi}/H_i)]$$

$$P_{HG} = P_G[1+(\phi_H/2)(J_{HG}/H_G)]$$

$$P_{HV} = P_V[1+(\phi_H/2)(J_{HV}/H_V)].$$

A drawback of this simplified setting is that it does not allow property developers to behave strategically to influence housing prices by accumulating an inventory of newly finished dwellings when prevailing market prices are low. This means the model can not capture the movement of building vacancy rates, which is one of the real estate market indicators. This strategic behavior could be important when there are unanticipated shocks, especially in stochastic models.

The current value Hamiltonian of the household's maximization problem is given by:

$$\begin{aligned} h_4 \equiv\ & U(H_4, C_4, M/P, N_4) \\ & +\lambda_A[(W/P)N_4 + rA - (P_V/P)I_V - \theta(P_G/P)I_G - (P_4/P)C_4 - i(M/P) - TX] \\ & +\sum_{i=G}^{V} \lambda_{JHi}\{I_V - J_{Hi}[1+(\phi_H/2)(J_{Hi}/H_i)\} \\ & +\sum_{i=G}^{V} \lambda_{Hi}(J_{Hi} - \delta_H H_i) \\ & +\lambda_{H4}[\beta_1(H_V)^{\beta 2} + (1-\beta_1)(H_G)^{\beta 2} - (H_4)^{\beta 2}] \\ & +\lambda_{N4}(N_4 - \sum_{i=1}^{3} N_i). \end{aligned}$$

Besides the original constraints, other first order conditions are given by:

$$J_{Hi} = (q_{Hi} - 1)(H_i/\phi_{Hi});\ i = G,\ V \tag{7.5a}$$

$$q_{HG} = \lambda_{HG} P/(\lambda_A \theta P_G) \tag{7.5b}$$

$$q_{HV} = \lambda_{HV} P / (\lambda_A P_V) \tag{7.5c}$$

$$U_{H4} = \lambda_{H4} \beta_2 (H_4)^{\beta 2-1} \tag{7.5d}$$

$$U_{C4} = \lambda_A P_4 / P \tag{7.5e}$$

$$U_{N4} = -\lambda_A W / P \tag{7.5f}$$

$$U_m = i \tag{7.5g}$$

$$\dot{\lambda}_A = (\mu - r)\lambda_A \tag{7.5h}$$

$$\dot{\lambda}_{HG} = (r + \delta_H)\lambda_{HG} - \lambda_{H4}(1-\beta_1)\beta_2 (H_G)^{\beta 2-1}$$

$$-\lambda_A \theta (P_G / P)(\phi_H / 2)(J_{HG} / H_G)^2 \tag{7.5i}$$

$$\dot{\lambda}_{HV} = (r + \delta_H)\lambda_{HV} - \lambda_{H4}\beta_1\beta_2 (H_V)^{\beta 2-1} - \lambda_A (P_V / P)(\phi_H / 2)(J_{HV} / H_V)^2. \tag{7.5j}$$

Equations (7.5a) to (7.5c) govern the formation of residential housing in a way similar to commercial building. Equation (7.5d) defines the value of the marginal benefit of housing services. Equation (7.5e) equates the marginal benefit of consuming one more unit of aggregate non-durable goods to its marginal cost. Equation (7.5f) implies that the household will supply labor services up to the point that the marginal disutility of working is just compensated by the marginal value of labor incomes. Equation (7.5g) warrants that the holding of real money balance will rise up to the point that the marginal benefit is just equal to the marginal cost, i.e. the nominal interest rate.

Equation (7.5h) states the dynamic of the shadow price of financial assets. When the domestic interest rate goes up, investment falls. All other things being equal, this must be matched by an increase in consumption. When consumption rises, the marginal utility of consumption, which is the shadow price of financial assets, declines. Equations (7.5i) and (7.5j) have similar interpretations as equation (7.2i).

Similar to the treatment of intermediate inputs in the production side, the composition of the aggregate good C_4 is determined by a second-tier optimization process:

maximize C_4

subject to:

$$(C_4)^{\beta 4} = \beta_3 (C_1)^{\beta 4} + (1-\beta_3)(C_2)^{\beta 4} \; ; \; \beta_4 \in (0,1]$$

$$P_4 C_4 = P_1 C_1 + P_2 C_2$$

where:

$$(P_4)^{1-\sigma 4} = \beta_3^{\sigma 4} (P_1)^{1-\sigma 4} + (1-\beta_3)^{\sigma 4} (P_2)^{1-\sigma 4} \; ; \; \sigma_4 = 1/(1-\beta_4).$$

Solving the maximization problem, it can be obtained:

$$C_1 = C_4 [\beta_3 (P_4 / P_1)]^{\sigma 4} \tag{7.6a}$$

$$C_2 = C_4 [(1-\beta_3)(P_4 / P_2)]^{\sigma 4}. \tag{7.6b}$$

Equations (7.6a) and (7.6b) state that for a given expenditure on non-durable goods, the budget share of, say, C_1 falls when its price rises relative to C_2.

7.3.3 Government

The government has to balance the budget in every period. The budget constraint of the government is given by:

$$\sum_{i=1}^{3} (P_{Li} / P) L_i + TX = (1-\theta)(P_G / P) I_G. \tag{7.7a}$$

The left-hand side of equation (7.7a) is the sum of the revenues from selling sector-specific factors to the industries and from the lump sum tax on the household. For simplicity, all the specific factors are supposed to be natural resources, so no production is involved. The right-hand side of equation (7.7a) is the spending on public housing. There is no need to explicitly incorporate money supply in the government budget constraint, insofar as the lump sum tax item will convey any money wealth to the household.[8]

The remaining role of government is possibly more important. Firstly, it controls the rate of land supply.[9] Secondly, it controls the distribution of land between residential and commercial purposes, as well as the distribution of residential land between private and public housing, in order to maintain the price differentials between various types of real estate. Lastly, it determines the level of subsidy on public housing. Indeed, these are precisely the roles of the Hong Kong government in the property markets.

Whenever the government determines the distribution of land usage, it is separating the property markets and hence creating price discrepancies between the three types of real estate. Nonetheless, 'controlling the distribution of land usage' is only a conceptual notion. In the model, it is assumed that the government controls the distribution of housing investment goods, which are something like semi-products. An important merit of this shortcut specification is that it can highly simplify the model. An essential question about the difference between controlling the distribution of land, and that of housing investment goods, is who bears the risk of property price fluctuation. In the former it is the developers, as there is a prolonged construction period, while in the latter it is the final users. With prefect foresight the two are equivalent. Nonetheless, in stochastic models such risk could be crucial in influencing agents' behavior. This specification is actually related to the adjustment cost issue discussed in Section 7.3.2.

The three functions of the government can be modeled either by exogenous variables or by endogenous policy reaction functions. For simplicity, both the rate of land supply and the level of subsidy are set exogenously.[10] In contrast, in determining the distribution of housing investment goods, it is assumed the government adopts a policy

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[8] If there is no lump sum tax item, then the money supply should be incorporated in the government budget constraint. Money supply will be a stock (or state) variable. Thereupon the consumption and investment behaviors of the government will become crucial in channeling the effects of money policies.

[9] Since there is no land bank in the model, there is no need to distinguish between 'land disposal' and 'land supply' here.

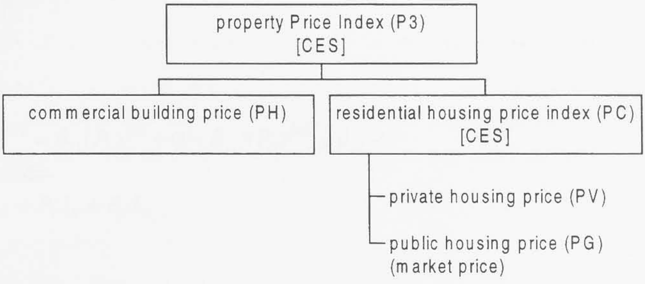
[10] A possible way to endogenize the rate of land supply and the level of subsidy simultaneously is to impose that the revenue collected from the former must be balanced by the expenditure on the latter. That is, the lump sum tax on the household is fixed at zero.

reaction function to minimize certain price indexes of the goods. By minimizing the price indexes, the government indeed constrains price discrepancies between the three real estate markets. Therefore, as a whole, the government is carrying out a restrained (or balanced) market segregation policy: dividing the three property markets on the one hand, and limiting the price discrepancies between the three markets on the other. As seen later in the simulations, the effect of this specification will envisage a high correlation between property prices. This effect seems to have support from Figure 6.3 in Chapter 6.

At the outset it should be pointed out that minimizing the property price index does not necessarily imply maximizing the utility of the household. The price minimization policy is preferred mainly for its transparency and tractability. Secondly, as discussed above, effective property prices are equal to the prices of housing investment goods corrected by the adjustment costs. Therefore, minimizing the property price index of housing investment goods is merely a convenient approximation of minimizing an index of effective property prices.

There are two property price indexes to be minimized. The nesting of the property price indexes is illustrated in Figure 7.3.

Figure 7.3: Property Price Index Nesting



The upper level minimization problem is given by:

minimize P_3

subject to:

$$(P_3)^{\beta 10} = \beta_9 (P_C)^{\beta 10} + (1-\beta_9)(P_H)^{\beta 10} \ ; \ \beta_{10} \in [1, \infty)$$

$$P_3 Y_3 = P_C I_C + P_H I_H$$

where:

$$Y_3 = I_H + I_C. \tag{7.8a}$$

Solving the problem, it can be obtained:

$$[\beta_9 / (1-\beta_9)](P_C / P_H)^{\beta 10-1} = I_C / I_H. \tag{7.8b}$$

Note that equation (7.8a) implies that industrial (I_H) and residential (I_C) housing investment goods are prefect substitutes, as they are produced by the same production function. Therefore, the price differentiation between these two commodities is purely a result of market separation. The same point holds for private and public housing investment goods. Equation (7.8b) indicates that to minimize the general property price index P_3, the share of residential housing investment goods will be increased when its price rises versus that of commercial building.

The share between private (I_V) and public (I_G) housing investment goods is determined by a second-tier price minimization process similar to the previous one:

minimize P_C

subject to:

$$(P_C)^{\beta 12} = \beta_{11} (P_V)^{\beta 12} + (1-\beta_{11})(P_G)^{\beta 12} \ ; \ \beta_{12} \geq 1$$

$$P_C I_C = P_V I_V + P_G I_G$$

where:

$$I_C = I_V + I_G.$$

It should be noted that, the market price of public housing (P_G) rather than the subsidized price (θP_G) is used in the index. Solving the problem, it can be obtained:

$$[\beta_{11} / (1-\beta_{11})](P_V / P_G)^{\beta 12-1} = I_V / I_G.$$

7.3.4 External Balance

The external accounts are specified as follows:

$$TB = (P_1 / P)EX - (P_K / P)\sum_{i=1}^{3} I_{Ki} \tag{7.9a}$$

$$CA = TB + rA^* \tag{7.9b}$$

$$\dot{A}^* = CA \tag{7.9c}$$

$$\mu = r^* \tag{7.9d}$$

$$z = ZP_K^* / P \tag{7.9e}$$

$$r = r^* + \xi + \dot{z} / z \tag{7.9f}$$

$$\xi = \beta_{16} - \beta_{17} rA^* / Y \tag{7.9g}$$

$$P_1 = ZP_1^* \tag{7.9h}$$

$$P_K = ZP_K^*. \tag{7.9i}$$

Equations (7.9a) and (7.9b) are merely the definitions of trade balance (*TB*) and current account balance (*CA*), respectively. Equation (7.9c) states that a current account surplus must be matched by a capital account deficit of the same size. A capital account deficit means the domestic household accumulates a larger financial claim against the rest of the world. Equation (7.9d) restates that the domestic subjective discount rate (μ) is set equal to the world interest rate (r^*). Equation (7.9f) defines the uncovered interest parity condition: the domestic interest rate is equal to the world interest rate plus a risk premium (ξ). The existence of risk premium is a matter of empirical fact. It can be raised by many different factors, such as perceived uncertainty of defaulting and impediments to capital flows. Notwithstanding, in this model, which embraces no uncertainty, the risk premium is more a device to ensure model closure. It also provides a simple platform to examine financial crisis without complicating the model with stochastic processes.

Equation (7.9g) specifies the risk premium as a function of the interest payment of foreign debt to GDP ratio. It implies that accumulation of foreign debt (asset) will come at the extra cost (benefit) of a higher (lower) interest rate. β_{16} is an exogenous component of the risk premium. As the domestic subjective discount rate is set equal to the world interest rate, equations (7.9f) and (7.9g) together constrain the home economy not to accumulate any foreign debts or assets in the long run. This actually poses a stronger binding condition on the system than the usual no-Ponzi game condition:

$$\int_0^\infty A^* e^{-r^* t} dt = 0.$$

A reason for using equation (7.9g) rather than the usual no-Ponzi game condition is that it is hard to transform the latter into a programmable equation under the setting of this model.

Equations (7.9f) to (7.9g) are crucial in the sense that they tie down the model in the long run, but allow the domestic interest rate to deviate from the world interest rate and the discount rate in the short run. Otherwise, the model will encounter "disturbing implications from the open-economy Ramsey model", in that all the dynamics are ruled out by forcing the domestic interest rate to be equal to the world interest rate and the discount rate at every period (Barro and Sala-i-Martin 1995:108).

An alternative specification of the risk premium is:

$$\xi = \beta'_{16} - \beta'_{17} A^* / Y. \tag{7.9j}$$

The difference between equations (7.9g) and (7.9j) is that the former targets the serving of the debt, while the latter targets the principle of the debt. Which one should be used is a matter of empirical issue. An analogy can be found in the choice of fiscal policy rule in macroeconomic models in whether the tax rate should target the government debt or the fiscal deficit to guarantee public solvency in the long run. Mitchell, Sault et al. (1998) find that qualitatively the two policy rules make no difference, whereas quantitatively the deficit rule gives rise to more monotonic behaviors for models than the other one. In this case, equation (7.9g) will give the domestic economy greater room to move around.[11] This is because, when the stock of foreign assets rises, the risk premium and hence the domestic interest rate will fall. But the fall in the domestic interest rate itself will retard the fall in the risk premium. As a consequence, the economy can sustain a larger change of foreign assets.

Another possible twist of equation (7.9f) is to add an error correction term to smooth the variation of the risk premium:

$$\xi = \beta_{16}'' - \beta_{17}'' rA^* / Y - \beta_{18}'' \Delta(rA^* / Y)$$

Again, the choice between the two specifications is an empirical rather than a conceptual issue. Equation (7.9f) is adopted due to its simplicity. Last, but not least, besides incorporating a risk premium, a completely different way to avoid the above small open economy problem is to endogenize the discount rate by, for instance, setting it as a function of consumption, as is done in Uzawa (1968). However, doing so will complicate the model in a very distracting way.

Equations (7.9h) and (7.9i) define the terms of trade, through specifying the values of imported capital investment goods and exportable manufacturing goods, respectively. The price of capital investment goods is set to be one as the numeraire.

7.3.5 The Rest of the Model

The rest of the model consists of market clearing conditions and some identities. In the above two sub-sections, the labor and money markets are already assumed to clear, as there is no explicit distinction between supplies of and demand for the two commodities. The market for the construction sector is also assumed to clear by equation (7.8a). The remains are the manufacturing and servicing markets:

[11] This has been verified in experimental simulations, which are not reported here.

$$Y_1 = \sum_{i=1}^{3} X_{1i} + C_1 + EX \qquad (7.10a)$$

$$Y_2 = \sum_{i=1}^{3} X_{2i} + C_2. \qquad (7.10b)$$

Equations (7.10a) and (7.10b) state that the output of these two sectors is disposed among intermediate inputs (X), domestic consumption (C), and, in the case of the manufacturing industry, export (EX). Two more identities are required:

$$\pi \equiv \dot{P} / P \qquad (7.10c)$$

$$m \equiv M / P. \qquad (7.10d)$$

The open economy model is basically completed up to equation (7.10d). However, so far the modeled economy works in a nominally frictionless environment. Inasmuch as all prices are flexible, money ceases to have any real impact.[12] Hence, the usefulness of the exchange rate regime is confined to either bringing in or insulating from foreign inflation. Obviously, such a conclusion is not very interesting. To introduce nominal rigidity, the wage setting equation is modified to allow partial backward looking behavior. Recall that if the nominal wage is completely flexible, given the values of all other variables, equations (7.2e) and (7.5f) together determine the equilibrium wage (W) and labor supply (N_4):

$$W = P_i Q^i_{Ni} \qquad (7.2e)$$

$$U_{N4} = -\lambda_A W / P. \qquad (7.5f)$$

Now the nominal wage is assumed to be determined by an error correction mechanism as follows:

$$\dot{W} / W = \beta_{18}(\tilde{W} - W) / W; \ \beta_{18} \in [0,1] \qquad (7.11a)$$

$$\tilde{W} = -U_{N4} P / \lambda_A . \qquad (7.11b)$$

[12] This has been verified in experimental simulations, which are not reported here.

β_{18} determines the flexibility of nominal wage; if it is equal to one, nominal rigidity ceases to exist. Equation (7.5f) is rewritten as equation (7.11b) to define the steady state nominal wage ($\tilde{W}$). So, in the short run, employment is mainly driven by the demand side, although the supply side also has an influence, via the equilibrium nominal wage. In this case, the labor market does not clear continuously anymore. Now the supply of labor is determined by equation (7.5f) and the demand by equation (7.2e); the unemployment rate is given by:

$$u = (N_4^S - N_4^D) / N_4^S .$$

Although the case of perfect nominal flexibility is not the concern of this study, it can serve as a benchmark, so the effects of the exchange rate regime can be brought out from the complexities of the model.

As asserted by Blinder (1997), a model with sticky prices and wages appears to be far more relevant for studying short run fluctuations. Further imposing price rigidity in this model will only magnify the quantitative, but not the qualitative, differences between fixed and flexible exchange rate regimes.

7.4 SIMULATIONS

7.4.1 Baseline and Simulations

As the modeling exercise is for theoretical rather than forecasting purposes, the parameters and exogenous variables of the model are imposed rather than estimated. However, the values of the world interest rate, the capital adjustment cost, and the capital depreciation rate are based on McKibbin and Sachs (1991). The world interest rate is set at 5 percent, indicating that one period corresponds roughly to one year. The share of government subsidy in public housing is assumed to be moderate at 30 percent. The lump sum tax on the household turns out to be a subsidy, because the revenue collected from selling specific factors is more than enough to finance expenditure on public housing. This reiterates the point that land sales can provide government with an indirect but effective means of taxation. The national account and other details of the modeled economy at the initial equilibrium are summarized in Tables 7.A2 to 7.A6 in

Appendix 7, and the values of the parameters and exogenous variables are listed in Table 7.A7.

The model consists of slightly over 100 equations; behavioral equations and identities are roughly of equal proportions. It is solved numerically using the computer program Fair-Taylor, which is based on the algorithm suggested by Fair and Taylor (1983). For a review of the numerical techniques used to solve this type of nonlinear rational expectation models, see McKibbin (1987) and McKibbin (1995), who has also developed the Fair-Taylor software.

A total of eight simulations are conducted, corresponding to three types of shocks and four regimes. The combinations are summarized in Table 7.2. Some auxiliary simulations are also briefly discussed when required for comparison. The first regime is the *benchmark*, in which all the nominal variables are perfectly flexible. Thereby it will generate exactly the same *real* result under any exchange rate arrangement. To simplify the movement of prices, a flexible exchange rate arrangement is chosen for the benchmark regime. The second regime is characterized by nominal wage rigidity and a flexible exchange rate, denoted as the *flexible regime*. The third regime is restrained by the same degree of nominal wage rigidity as in the last one, but with a fixed exchange rate. This is denoted as the *fixed regime*. The last regime is the same as the fixed regime, but the output price of the construction sector is fixed, and land supply is endogenized instead. This is denoted as the *fixed price regime*.

Table 7.2: Summary of Simulations

Regime	Specifications	Permanent nominal shock	Permanent land supply shock	Temporary financial shock
Benchmark	Flexible exchange rate, flexible nominal wage			
Flexible regime	Flexible exchange rate, sluggish nominal wage			
Fixed regime	Fixed exchange rate, sluggish nominal wage			
Fixed price regime	Fixed exchange rate, sluggish nominal wage, fixed property prices			

The purpose of considering multiple regimes is to provide a controlled environment and, thus, to isolate the effects of individual factors. In particular, the comparison between the results of the first and second regimes can reveal the impacts of nominal wage rigidity, and that between the second and third regimes can delineate the differences between the two exchange rate arrangements.

The first set of experiments is a permanent increase in the domestic nominal money supply by 5 percent. Only the flexible regime is considered, as the money supply becomes endogenous under the other regimes. This simulation aims to illustrate how monetary policies influence property markets when there is nominal rigidity. This exercise sheds light on the results of other simulations, as the fundamental difference between flexible and fixed exchange rate regimes is the amount of money supplied. The second set of experiments is a permanent rise in the supply of land by 10 percent. As explained in Chapter 6, land supply is an increasingly important policy instrument in Hong Kong. Both the flexible and fixed regimes are considered to demonstrate the interaction between property markets and the exchange rate arrangement.

The last set of simulations is a temporary financial crisis. The crisis is modeled as a jump in the exogenous component of the risk premium, β_{16}. This can be interpreted as a reevaluation of investment risks in the home country, especially in terms of redeeming foreign debts. Moreover, a controversial issue that arose in Hong Kong during the Asian crisis was the nine months moratorium on land sales announced in June 1998. The purpose of the moratorium is to stabilize property price. This study tries to examine the impact of such a policy on the recovery of an economy disrupted by a risk premium shock.[13] The policy is modeled by endogenizing land disposal in order to fix the output price of the construction sector.

Obviously, by no means can the risk premium shock give a sufficient account for the recent Asian financial crisis. As discussed in detail in McKibbin and Martin (1998), the Asian crisis seems to have been a combination of multiple shocks. They suggest the primary shocks were probably a (downward) reevaluation of the future profitability of

[13] As discussed in Chapter 2, there is no presumption about the non-optimality or optimality of the moratorium here. This chapter just examines the macroeconomic consequence of such an action.

investment in many of the 'miracle' Asian economies. As those countries' capacity for repaying foreign debts was being revised, the risk premiums for lending to them were scaled up accordingly. The story did not end here, as a series of secondary shocks followed.

A higher risk premium pushed up domestic real interest rates and caused a real devaluation. Firms exposed to large unhedged foreign borrowings easily turned into insolvency. Furthermore, due to intense speculative pressure on Asian currencies, a break of de facto exchange rate links between those currencies and the US dollar and thus a substantial depreciation were largely factored into market expectation. Lastly, the disarray in financial markets and the economic uncertainty following the onset of the crisis degenerated into a credit crunch, suffocating production of both structurally viable and nonviable establishments. All these second waves added to the investment risk in the home country and raised the risk premiums in Asian economies further.

In a word, while risk premium shock itself is not the primary source of the problems underlying the Asian crisis, it provides a useful *quantifiable (partial) reflection* of those problems. On the other side, due to the setting of the model, it is more appropriate to interpret the simulation results as the most efficient adjustment processes through which the crisis-hit economies can recover when there is *no* market failure, rather than a conjecture of the reality.[14]

In the following simulation, the exogenous component of the risk premium increases by 0.01 during the first three periods and returns to the benchmark zero level thereafter. The scale of the shock is far more moderate than that observed in Hong Kong and other disrupted Asian economies.

In summary, the simulations carried out in the following are experimental in nature. The outcomes are inevitably restrained by the structure and parameters of the model. Nevertheless, the important aspect of the experiments is to pinpoint the unique and significant role of property markets in macroeconomic analysis, and to highlight the possible channels through which property markets interact with the rest of the economy. Concrete policy recommendations can not be made without addressing some more fundamental issues not covered here. Nonetheless, understanding the transmission mechanisms, as this study attempts to do, is essential for addressing any policy issues.

7.4.2 Money Supply Shock

In this simulation, the domestic nominal money supply increases permanently by 5 percent. The shock basically resembles the case that Hong Kong imports lower interest rates from the US via the currency board arrangement. Selective results are shown in Figures 7.4 to 7.11b.

The impact of the money supply shock is a straightway short run expansion due to nominal wage rigidity, followed by gradual resumption of long run neutrality. In the short run, output prices increase faster than the sticky nominal wage, causing real wage to fall. A familiar result of aggregate-demand-aggregate-supply models is yielded, in that a monetary expansion leads to a (temporary) rise in industrial outputs and a fall in the unemployment rate. The movement of the nominal wage reflects the degree of nominal rigidity in the model (Figure 7.9). After three periods, the nominal wage has adjusted over 73 percent towards its new equilibrium level. But the impact on physical capital and housing is far longer lasting, as the stocks accumulated in the initial period take time to depreciate (Figure 7.6).

The discrepancy between the GDP deflator and housing prices deserves attention (Figure 7.11b). Given the adjustment costs, the housing supply is inelastic in the short run. Consequently, in the initial period, housing prices surge faster than the deflator. This inflationary discrepancy basically explains the formation of the property inflation spiral in Hong Kong during the early 1990s. A positive demand shock arising from China's economic recovery, plus the US's lower interest rates, prompted the inflation of real estate to be higher than that of general inflation in Hong Kong. The pressure

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[14] Noland, Liu et al. (1998) model the crisis with a real exchange rate shock along with a negative productivity shock to capture the interruption in the financial market. But such a treatment is rather ad hoc.

Figure 7.4: Industrial Output and Real GDP (Nominal Shock)

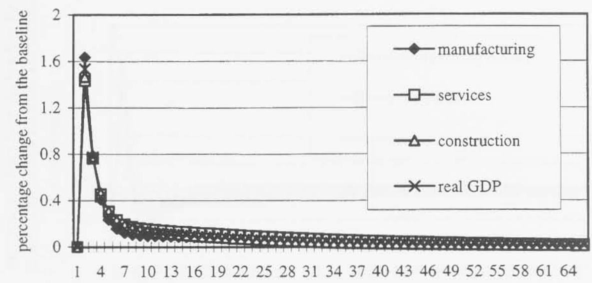


Figure 7.5: Consumption (Nominal Shock)

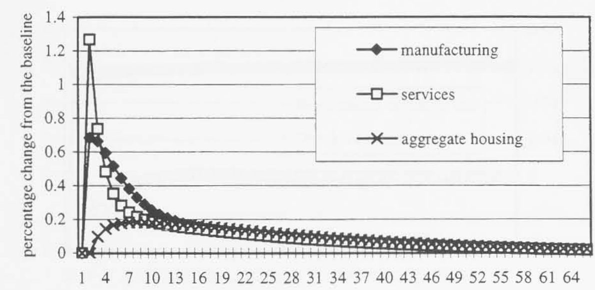


Figure 7.6: Industrial Building and Residential Housing Stocks (Nominal Shock)

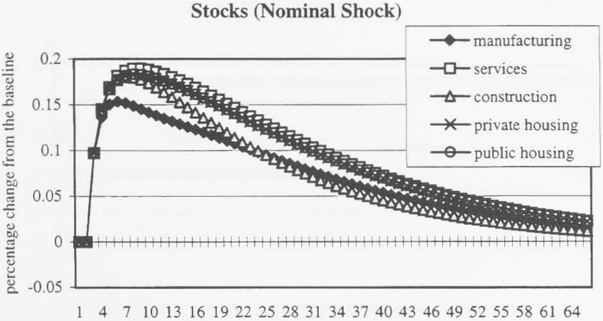


Figure 7.7: External Balance (Nominal Shock)

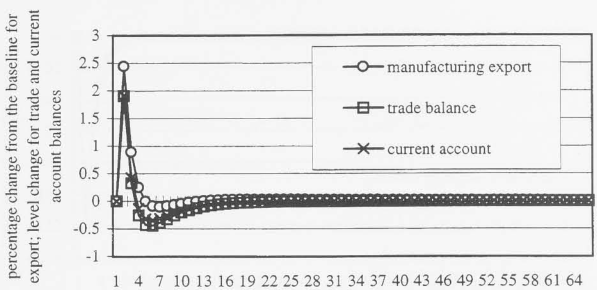


Figure 7.8: Exchange Rates (Nominal Shock)

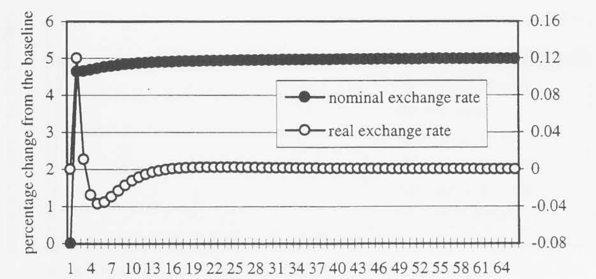


Figure 7.9: Wages (Nominal Shock)

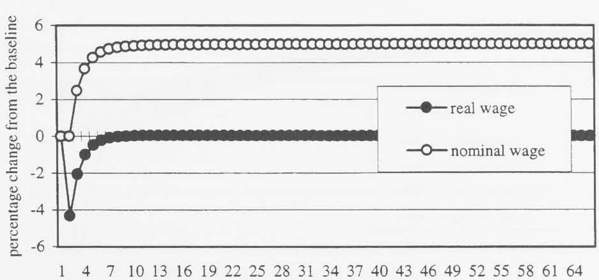


Figure 7.10: Unemployment Rate (Nominal Shock)

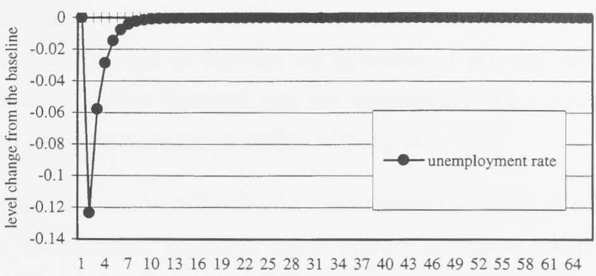


Figure 7.11a: GDP Deflator and Housing Prices (Nominal Shock)

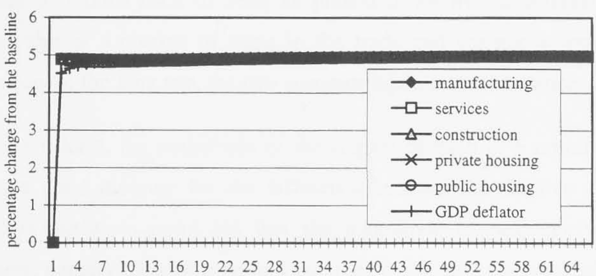
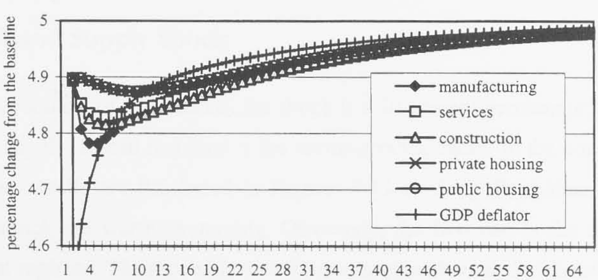


Figure 7.11b: GDP Deflator and Housing Prices - A Magnified View (Nominal Shock)



stemmed from rising property prices forcing people to seek an effective means of hedging inflation. The real estate market itself provided a natural solution to the problem created within it – and a vicious circle was formed. Notwithstanding, this model can not be used to illustrate the formation of property asset bubbles, as the assumption of perfect foresight and the convergence requirement in the solution algorithm have precluded the possibility of doing so.

On the front of external balances, the small country scenario of monetary expansion prevails. The monetary expansion causes nominal as well as real deprecation (Figure 7.8). The latter is much smaller than the former in terms of magnitude, since the effect of the former is partially neutralized by domestic inflation. The trade and current account balances of the home economy improve in the short run (Figure 7.7), resulting in mounting foreign assets. Notwithstanding, in the long run, the holding of foreign assets has to reduce back to zero, as pinned down by the interest parity condition. Matching this is a change of signs in the trade and current account balances in the medium run. In the long run, the two accounts again resume balance.

Last, but not least, the magnitude of the impact of such as a nominal shock basically provides a good measure for the difference between the flexible and fixed regimes. Thus, it is useful to point out that the magnitude is particularly sensitive to two parameters, namely the risk premium parameter, β_{17}, and the nominal wage adjustment parameter, β_{18}. The first parameter governs the magnitude of fluctuation of the domestic real interest rate, and the second one the speed of adjustment towards the long run neutrality equilibrium.

7.4.3 Land Supply Shock

In the second set of simulations, the shock is a 10 percent permanent increase in the rate of land supply. Recall that land is the sector-specific factor in the construction industry. Selective results are illustrated in Figures 7.12 to 7.40. Two dimensions of the land policy shock are worth examining. Obviously, the first one is the difference between different regimes. The second is the rather unexpected result for the external balance.

Figure 7.12: Real GDP
(Land Supply Shock)

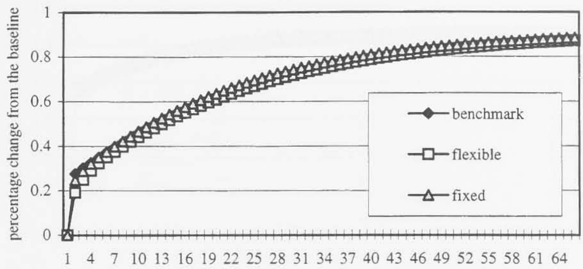


Figure 7.13: Output of Manufacturing Sector
(Land Supply Shock)

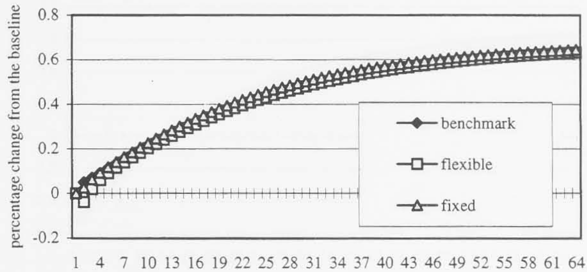


Figure 7.14: Output of Service Sector
(Land Supply Shock)

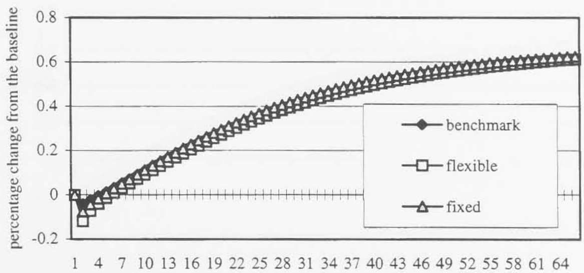


Figure 7.15: Output of Construction Sector (Land Supply Shock)

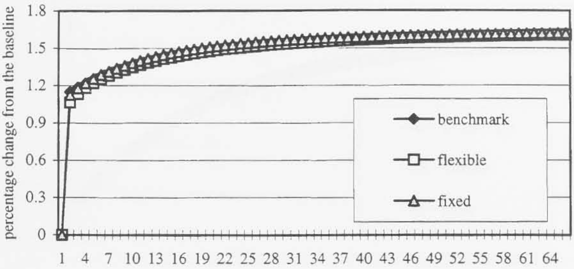


Figure 7.16: Consumption of Manufacturing Goods (Land Supply Shock)

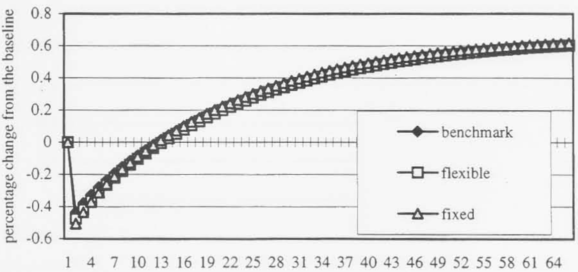


Figure 7.17: Consumption of Services (Land Supply Shock)

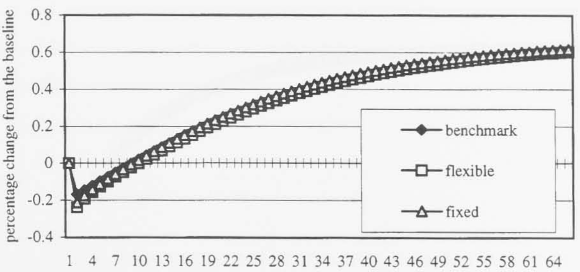


Figure 7.18: Industrial Building Stock in Manufacturing Sector (Land Supply Shock)

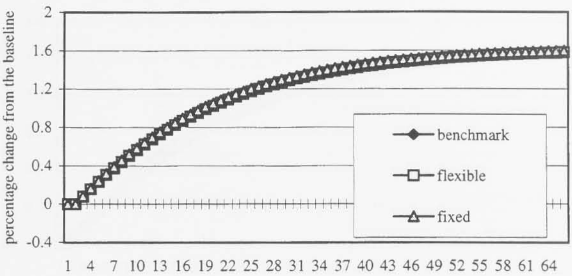


Figure 7.19: Industrial Building Stock in Service Sector (Land Supply Shock)

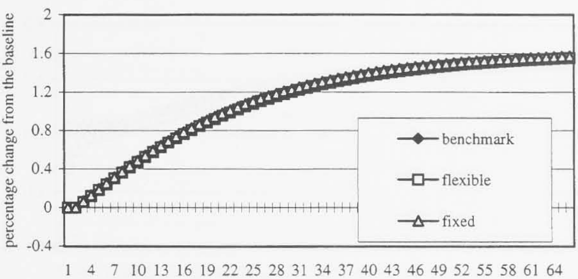


Figure 7.20: Industrial Building Stock in Construction Sector (Land Supply Shock)

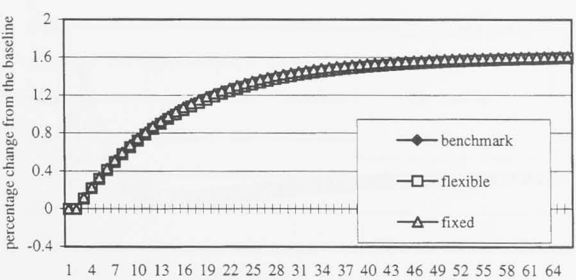


Figure 7.21: Aggregate Residential Housing
(Land Supply Shock)

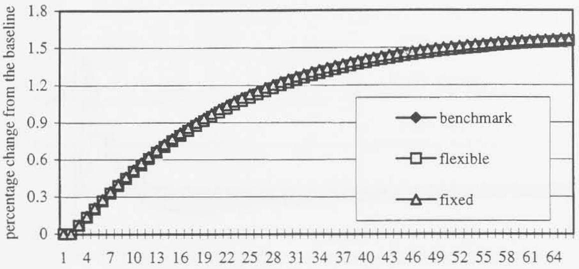


Figure 7.22: Export of Manufacturing Goods
(Land Supply Shock)

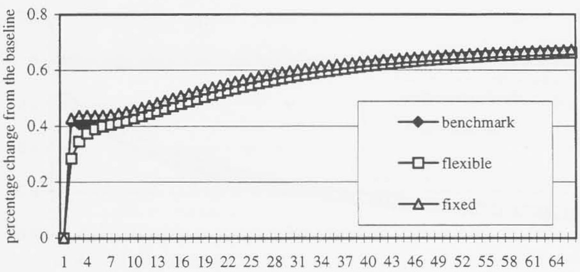


Figure 7.23: Trade Balance
(Land Supply Shock)

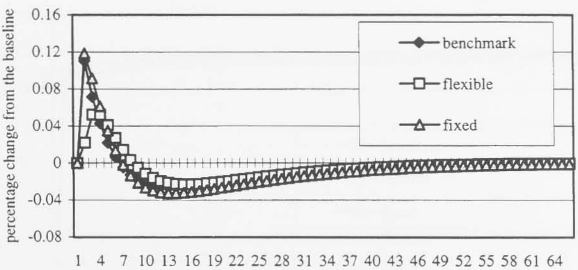


Figure 7.24: Current Account Balance
(Land Supply Shock)

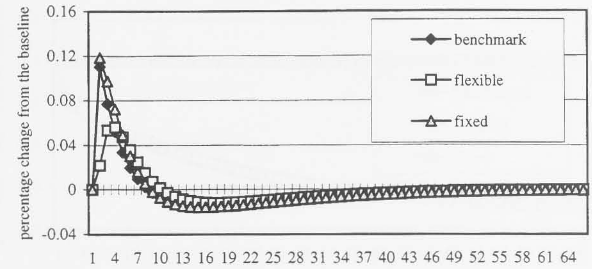


Figure 7.25: Nominal Exchange Rate
(Land Supply Shock)

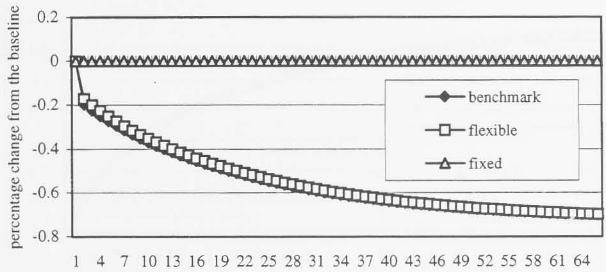


Figure 7.26: Real Exchange Rate
(Land Supply Shock)

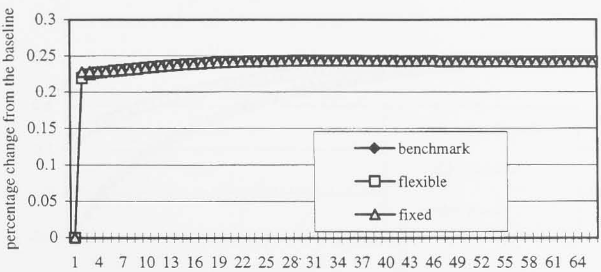


Figure 7.27: Nominal Exchange Rate
(Land Supply Shock)

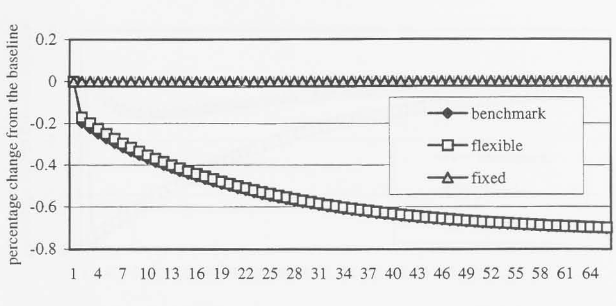


Figure 7.28: Nominal Monetary Supply
(Land Supply Shock)

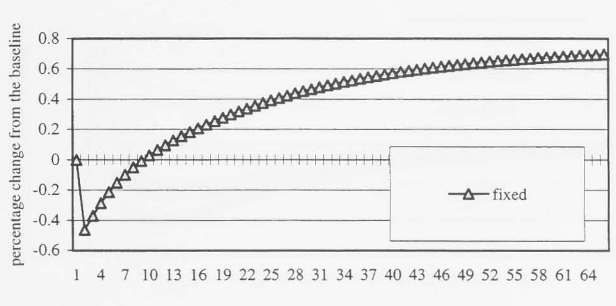


Figure 7.29: Real Monetary Supply
(Land Supply Shock)

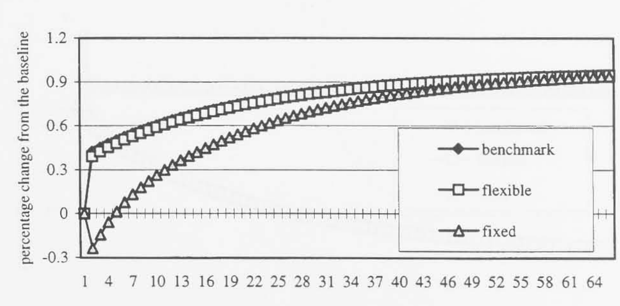


Figure 7.30: Nominal Interest Rate
(Land Supply Shock)

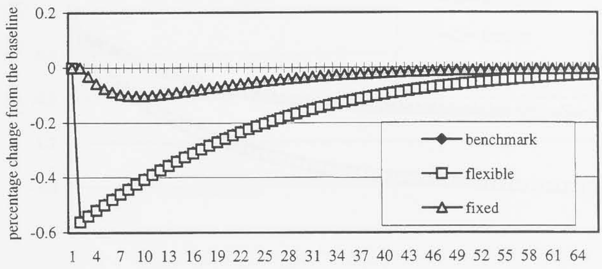


Figure 7.31: Real Interest Rate
(Land Supply Shock)

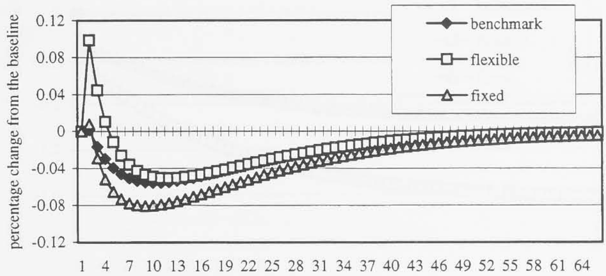


Figure 7.32: GDP Deflator
(Land Supply Shock)

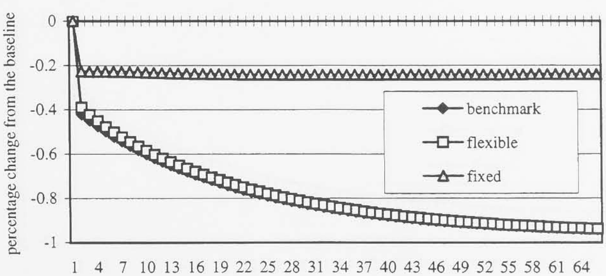


Figure 7.33: Price of Industrial Building in Manufacturing Sector (Land Supply Shock)

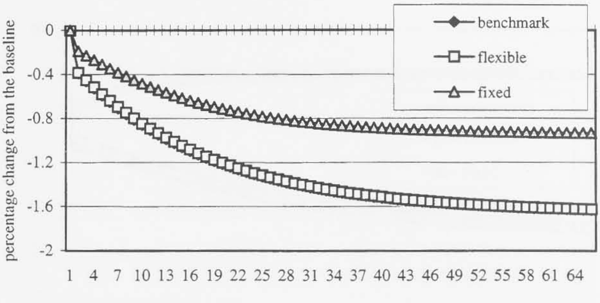


Figure 7.34: Price of Private Residential Housing (Land Supply Shock)

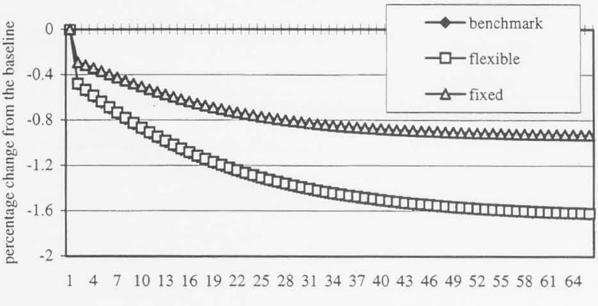


Figure 7.35: Price of Manufacturing Goods (Land Supply Shock)

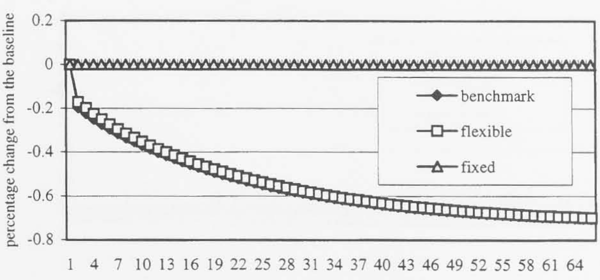


Figure 7.36: Price of Services (Land Supply Shock)

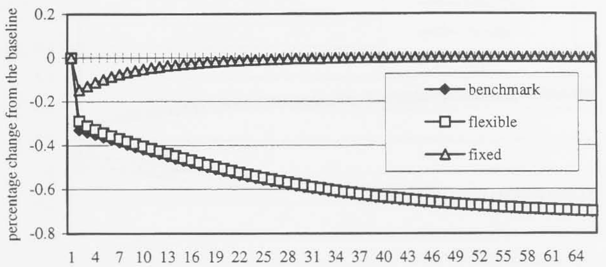


Figure 7.37: Price of Construction Output (Land Supply Shock)

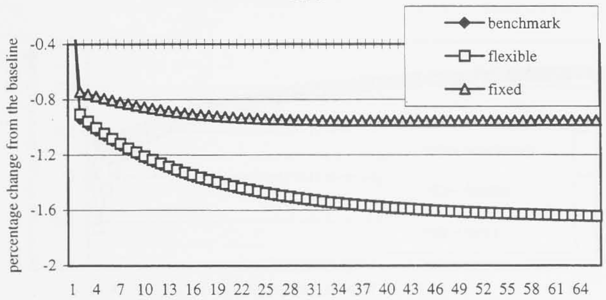


Figure 7.38a: Price of Land (Land Supply Shock)

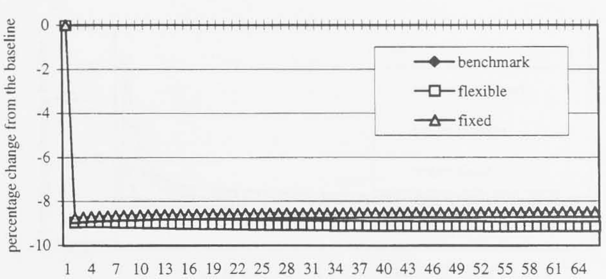


Figure 7.38b: Price of Land - A Magnified View (Land Supply Shock)

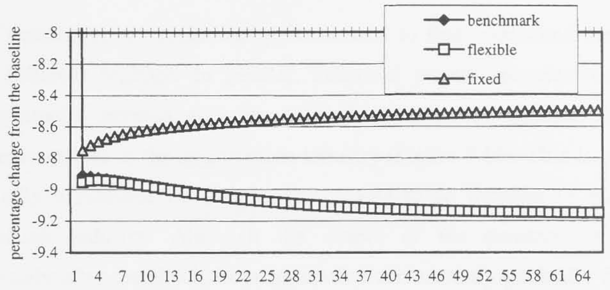


Figure 7.39: Total Employment (Land Supply Shock)

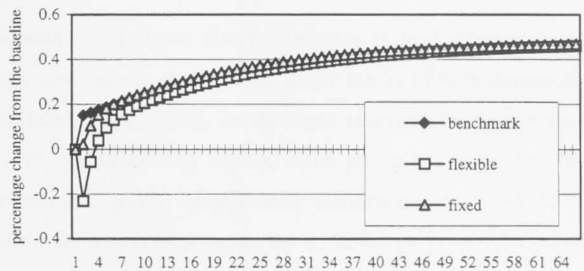
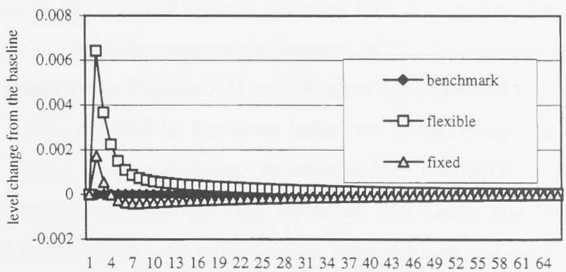


Figure 7.40: Unemployment Rate (Land Supply Shock)



7.4.3.1 Common Results

Before examining any dissimilarity, it is useful to first understand the common results across different regimes. In general, industrial outputs, physical capital stocks and housing stocks increase as a result of the land policy change. The largest boom expectedly resides in the construction industry (Figure 7.15). This is because the shock is virtually a resource boom, and comparable to an increase in productivity in the construction industry. Although the output of the construction industry jumps immediately after the shock, housing stocks increase only gradually due to adjustment costs (Figures 7.18 to 7.21). Echoing this is a fall in all property prices (Figures 7.33 and 7.34). This is because the price minimization processes guarantee any increment in housing investment goods will be shared by all property markets according to their weightings in the property price indexes.

The simulation result shows that the increase in land disposal encourages investment and savings (see below). As a result, larger stocks of both domestic and foreign assets are accumulated (Figure 7.24). As the home economy becomes a net creditor to the rest of the world, manufacturing exports must go up by more than the rising import of capital investment goods. Nonetheless, manufacturing output does not pick up fast enough in the short run. As a result, the initial surge in manufacturing exports has to be matched by a fall in private consumption (Figure 7.16). Likewise, higher savings lead to a decline in the consumption of services (Figure 7.17).

7.4.3.2 External Balances

The dynamic of the external balance deserves special attention. To help shed light on the results, it is useful to compare the impacts of similar resource booms in the three industries, respectively. Figures 7.41 to 7.49 show the impact of a 10 percent permanent rise in the specific factor in the three industries, respectively, under the benchmark regime. In Figure 7.41, the curve "manufacturing" corresponds to the impact of a resource boom in the manufacturing sector on real GDP, and the curve "services" corresponds to that of a resource boom in the service sector, and so forth.

The first consideration is the result of a specific factor shock on the manufacturing industry. With a larger input of specific factor, the output of the manufacturing industry

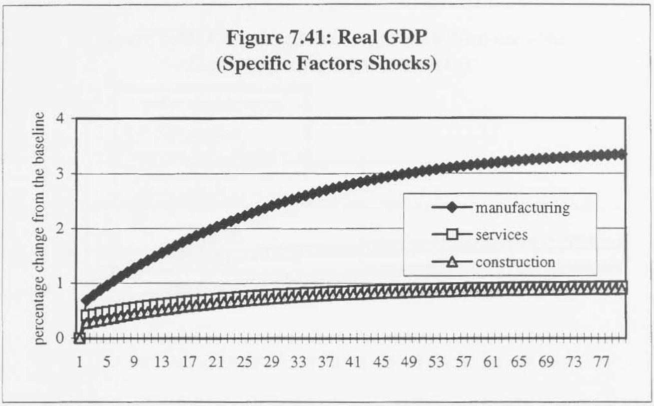


Figure 7.41: Real GDP
(Specific Factors Shocks)
percentage change from the baseline
manufacturing
services
construction
0
1
2
3
4
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77

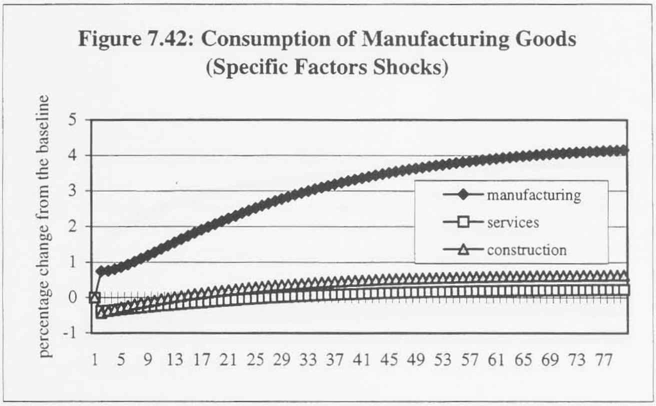


Figure 7.42: Consumption of Manufacturing Goods
(Specific Factors Shocks)
percentage change from the baseline
manufacturing
services
construction
-1
0
1
2
3
4
5
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77

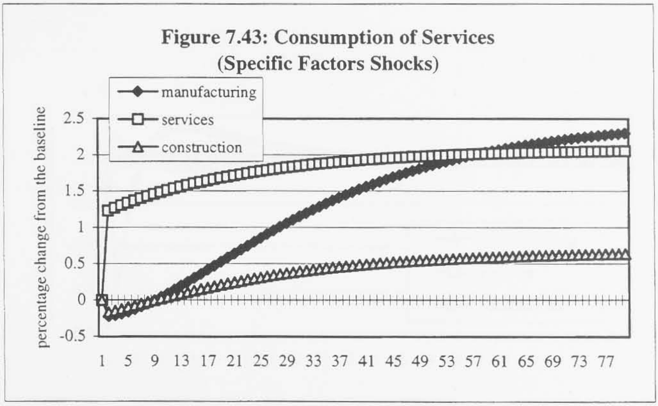


Figure 7.43: Consumption of Services
(Specific Factors Shocks)
manufacturing
services
construction
percentage change from the baseline
-0.5
0
0.5
1
1.5
2
2.5
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77

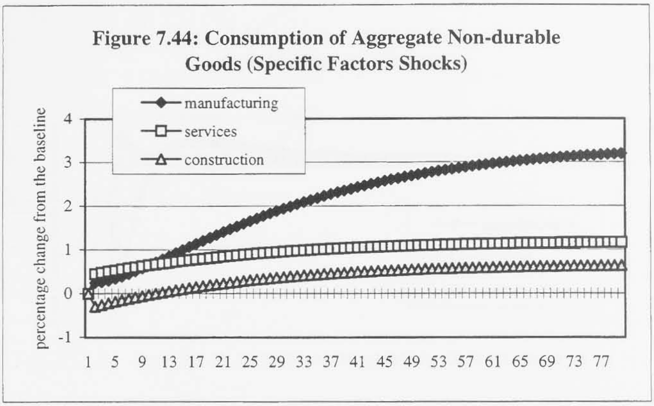


Figure 7.44: Consumption of Aggregate Non-durable Goods (Specific Factors Shocks)
manufacturing
services
construction
percentage change from the baseline
4
3
2
1
0
-1
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77

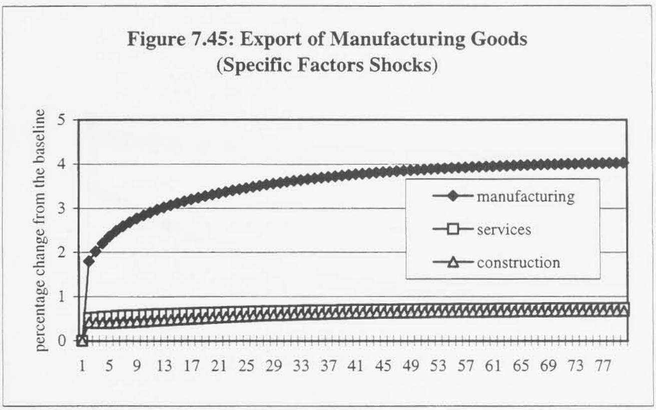


Figure 7.45: Export of Manufacturing Goods (Specific Factors Shocks)
manufacturing
services
construction
percentage change from the baseline
5
4
3
2
1
0
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77

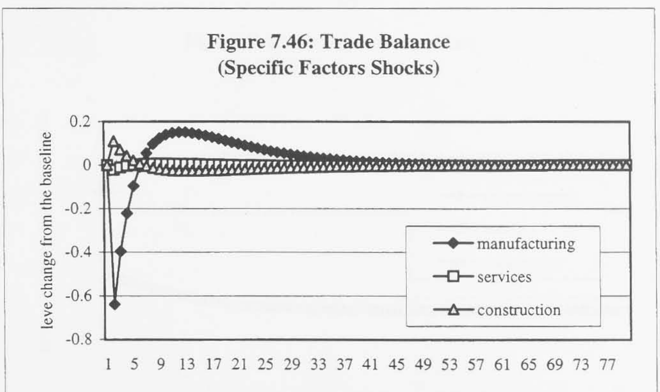


Figure 7.46: Trade Balance (Specific Factors Shocks)
manufacturing
services
construction
leve change from the baseline
0.2
0
-0.2
-0.4
-0.6
-0.8
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77

Figure 7.47: Current Account Balance
(Specific Factors Shocks)

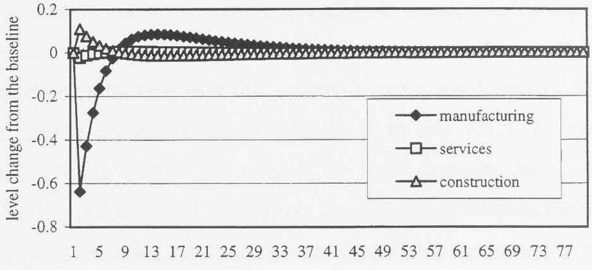


Figure 7.48: Nominal Exchange Rate
(Specific Factors Shocks)

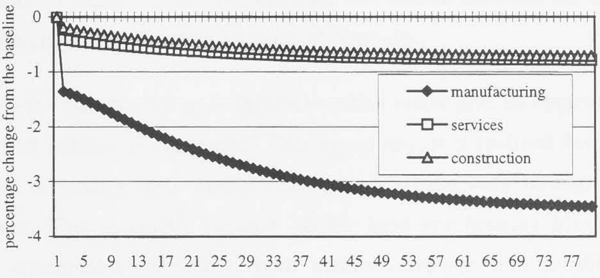
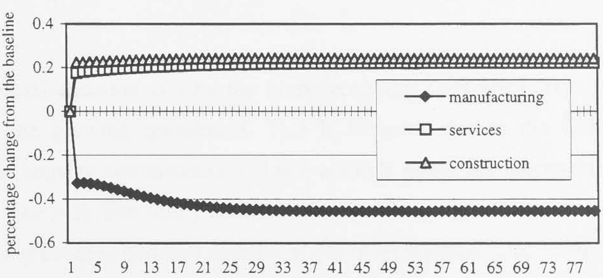


Figure 7.49: Real Exchange Rate
(Specific Factors Shocks)



immediately leaps right after the shock and then continues to increase. The current consumption of tradable manufacturing goods also rises. But the increase in output outpaces that in consumption, leading to a surge in manufacturing exports (Figure 7.45). However, to cater for the larger demand for capital stocks in all industries, capital imports grow even faster than manufacturing exports, resulting in a deterioration of the trade and capital account balances (Figures 7.46 and 7.47). Echoing this is a real appreciation (Figure 7.49). Thus, overall, the home economy borrows from the rest of the world in the initial period, and repays the debt when manufacturing output goes up. This is a typical result for a resource boom in a tradable consumption goods sector.

While the story for a resource boom in the service sector is similar, a key distinction is that services are not tradable. Therefore, the economy can not borrow as much as in the previous case. Consequently, expansion of the economy is much smaller. The dynamic of the external balance is similar; the trade and current accounts are in deficit initially. But the magnitude is scaled down very substantially.

Why does the resource boom in the construction sector give an opposite result, as far as the external balance is concerned? Retrospectively, it is realized that, in the long run, the effect of greater land supply can be materialized only through higher domestic investment. This is simply because neither land nor housing investment goods are directly consumable. Secondly, both commodities are non-tradable, so the home economy can not export them in exchange for foreign consumer goods. Thirdly, since the accumulation of housing and physical capital is subject to adjustment costs, materialization of the boom has to be mostly delayed into the future. The simulation results show that the rise in domestic investment is wholly financed by higher domestic saving.

An essential equation is why the home economy does not borrow from overseas to finance the growing investment. This is because, due to the Cobb-Douglas utility function, housing commodities and non-tradable goods are Edgeworth complementary, that is, $U_{HC} > 0$. The utility maximization process requires the marginal utilities from consuming housing and non-durable goods to be equated. Due to the adjustment costs, housing stocks are contemporaneously static. Therefore, the household prefers to save more in the short run to accelerate the process of housing investment, so that it can consume more of both commodities simultaneously in the later period. This is verified from the fact that, in the case of resource booms in both the manufacturing and service sectors, the consumption of aggregate non-durable goods (i.e. manufacturing goods plus services) rises in the initial period (Figure 7.44). While, in the case of a resource boom in the construction sector, consumption actually falls.

In summary, the non-tradability and adjustment costs of housing are the crucial aspects of the impact of a land supply shock on the external balance. Forasmuch as services are non-tradable but incur no adjustment cost, the outcome for a resource boom in the service industry is something in between the previous two cases, as illustrated in the simulation.

Lastly, the figures suggest that the changes in the trade and current account balances are rather small. This is due to the fact that, to facilitate the non-linear program to converge, it is necessary to assign the risk premium parameter β_{17} a fairly large value – 1.0. In principle, the smaller the value of β_{17}, the larger the change of the external balance.

7.4.3.3 Dutch Disease

It is worth pointing out that the output of the service industry reduces only marginally in the first few periods (Figure 7.14). Initially this is paralleled by a fall in output price and labor input in the service industry (Figure 7.36). In other words, there is a slight tendency for the service sector to contract. In the literature, such a contraction effect of resource booms is commonly called the Dutch disease.

Expansion in one sector can cause contraction in others because of two factors. Firstly, the booming sector attracts labor and mobile resources from other sectors, pushing up production costs in the latter. This is referred to as the resource movement effect (Corden and Neary 1982). Secondly, changes in relative prices shift consumption demand towards the cheaper output of the booming sector. This is referred to as the spending effect (ibid.).

In this model, the Dutch disease is rather mild. This is because industrial production is linked closely by intermediate inputs and commercial building. The positive land supply shock reduces the price of commercial building, and the cost of production in the service industry. Secondly, housing production also requires services as an intermediate input, helping to maintain the output price of the service industry. Thirdly, the land supply shock increases total labor supply. This explains why the price of services falls only very marginally, and why the output of the service industry shrinks only during the very early period. In the longer-term, demand for services is actually boosted by higher incomes.

The same story can be applied to the manufacturing industry. Nonetheless, the manufacturing industry is further sheltered from contraction by the fact that it is the sole export sector and its output price is fixed at the world level.

Furthermore, the effect of contraction becomes conditional on factor intensity, once capital is mobile across sectors in the long run. Behind this ambiguity is the Rybczynski effect: at constant output prices, when labor is extracted away by the booming sector, the output of the remaining labor-intensive sector declines and that of the capital-intensive sector rises. In the model, the factor intensities of all the industries are set to be the same, and capital is importable. Therefore, the Rybczynski effect is eliminated.

7.4.3.4 Dissimilarities

Now turning to another dimension of the comparison: the differences between the three regimes. Discrepancies mostly reside on the nominal rather than on the real side. The reason why the three regimes yield similar real results is that the change in nominal money supply under the fixed regime is very small, only in the order of 0.1 percent. In the last simulation, it was shown that a 5 percent monetary expansion generates short run real effects with a magnitude of about 0.1 to 1 percent. Together these infer that the real differences between the three regimes under a 10 percent land supply shock will be fairly insignificant.

The close resemblance between the benchmark case and the flexible regime extends to nominal variables such as prices, the nominal wage and the nominal exchange rate. Nevertheless, the fixed regime gives rise to significant permanent deviations from the other cases for all prices. The differences on the nominal side are obviously a result of a change in the money supply in order to maintain the nominal exchange rate. The results for the flexible regime show that the nominal exchange rate appreciates across time. It implies a pressure to loosen the money base under the fixed regime (Figure 7.28). The rising trend of liquidity in the domestic money market is transmitted into price discrepancies between the fixed regime and the other two regimes (Figures 7.32 to

7.38b). The initial fall in the nominal money supply arises from the fact that the GDP deflator needs to contract at the beginning to engender a real depreciation comparable to those in the other two regimes.

Last but not least, the flexible regime incurs the largest change in the unemployment rate (Figure 7.40), even though the absolute value of the change is small. This is because the resource boom lowers output prices, raising the real wage under the flexible regime. The fixed regime is largely sheltered from an upsurge in unemployment because the GDP deflator falls by a smaller proportion.

7.4.4 Financial Shock

In this set of simulations, the shock is a hike in the risk premium by 1 percentage point from the baseline of zero for three consecutive periods. The results for the fixed price regime are momentarily put aside while the results for the other three regimes are discussed. The results are illustrated in Figures 7.50 to 7.73. The second turning point at period four is due to the vanishing of the shock.[15] As in the previous simulation, the outcomes for the benchmark case and the flexible regime resemble each other. In terms of the altitude of fluctuation, few differences are found in GDP, unemployment, and real wage, as the economy adjusts faster when there is no nominal rigidity. In the following, the common results of the three regimes are again considered first, and then differences are discussed.

7.4.4.1 Revitalization

The basic mechanism of economic recovery under such a financial shock is simple: the home economy exports its way out via a real depreciation (Figures 7.63 to 7.67). Therefore, the current account balance improves sharply (Figure 7.65). Echoing this is a contraction in domestic consumption (Figures 7.54 and 7.55). This essentially reflects the revitalization process that most crisis-hit Asian economies have undergone from

[15] Therefore, if the financial shock dies out gradually, rather than suddenly, the economy will converge to the steady state smoothly without experiencing the second turning point.

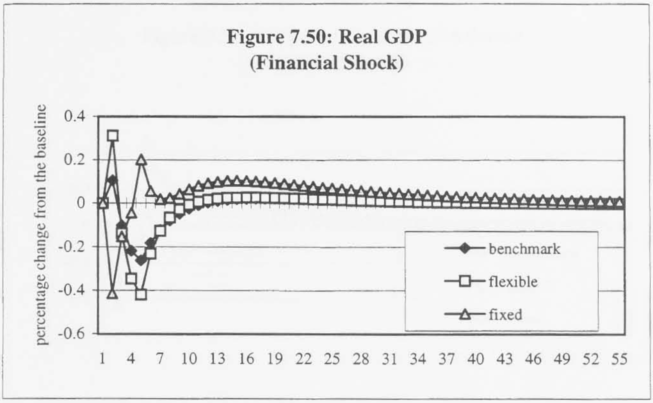


Figure 7.50: Real GDP
(Financial Shock)
percentage change from the baseline
0.4
0.2
0
-0.2
-0.4
-0.6
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55
benchmark
flexible
fixed

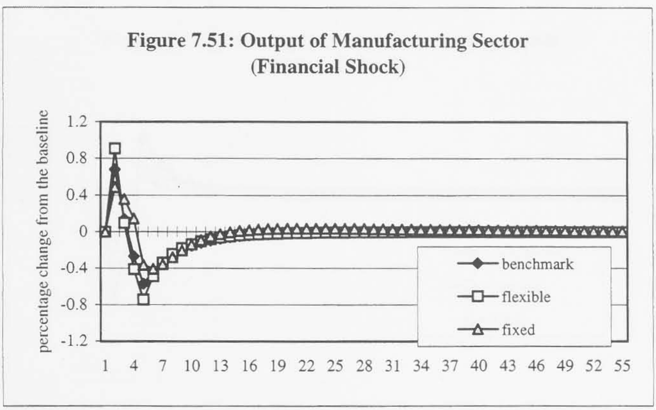


Figure 7.51: Output of Manufacturing Sector
(Financial Shock)
percentage change from the baseline
1.2
0.8
0.4
0
-0.4
-0.8
-1.2
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55
benchmark
flexible
fixed

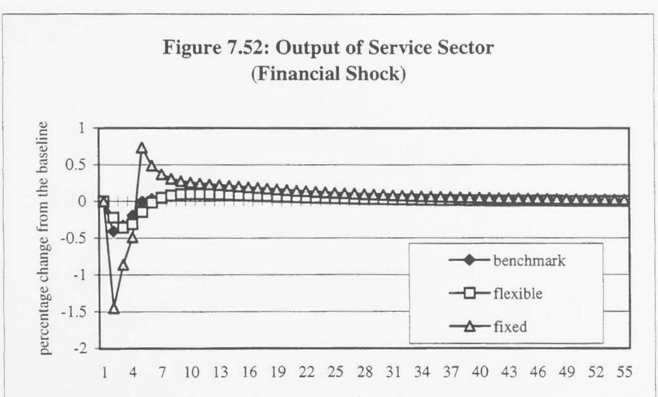


Figure 7.52: Output of Service Sector
(Financial Shock)
percentage change from the baseline
1
0.5
0
-0.5
-1
-1.5
-2
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55
benchmark
flexible
fixed

Figure 7.53: Output of Construction Sector
(Financial Shock)

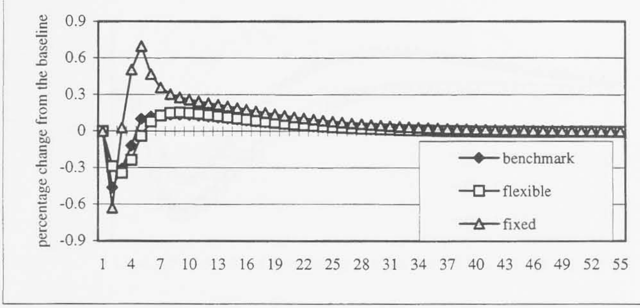


Figure 7.54: Consumption of Manufacturing Goods
(Financial Shock)

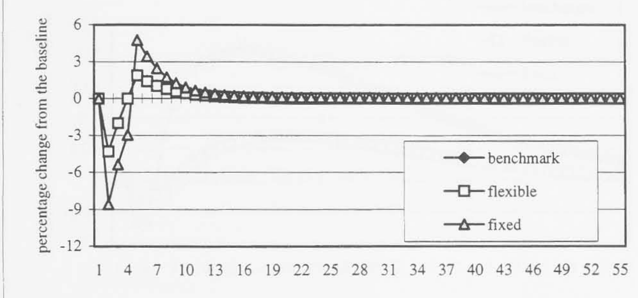


Figure 7.55: Consumption of Services
(Financial Shock)

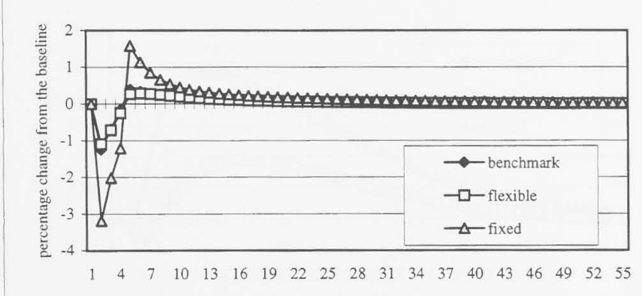


Figure 7.56: Industrial Building Stock in Manufacturing Sector (Financial Shock)

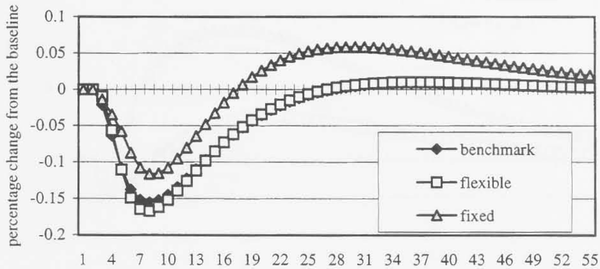


Figure 7.57: Industrial Building Stock in Service Sector (Financial Shock)

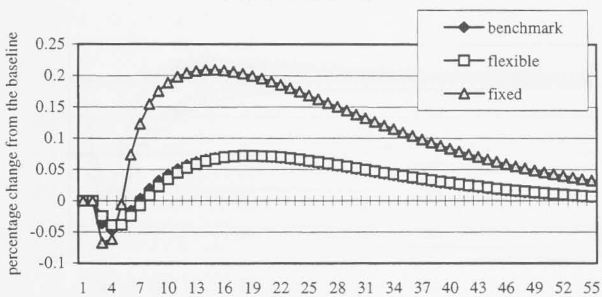


Figure 7.58: Industrial Building Stock in Construction Sector (Financial Shock)

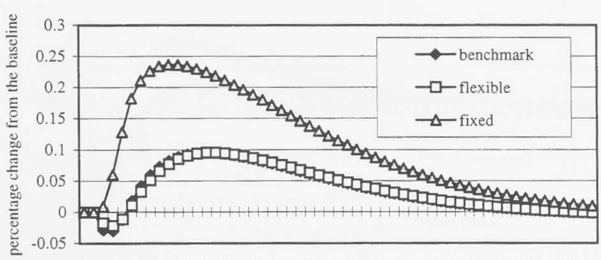


Figure 7.59: Aggregate Residential Housing (Financial Shock)

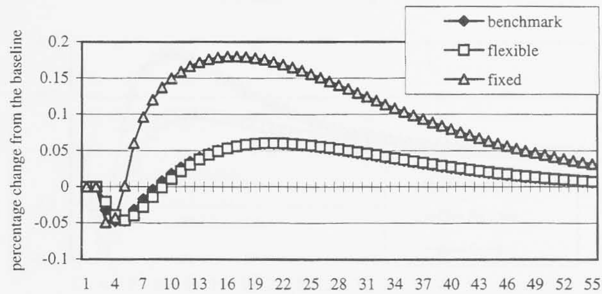


Figure 7.60: Physical Capital in Manufacturing Sector (Financial Shock)

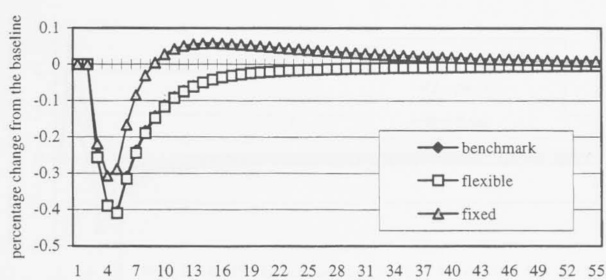


Figure 7.61: Physical Capital Stock in Service Sector (Financial Shock)

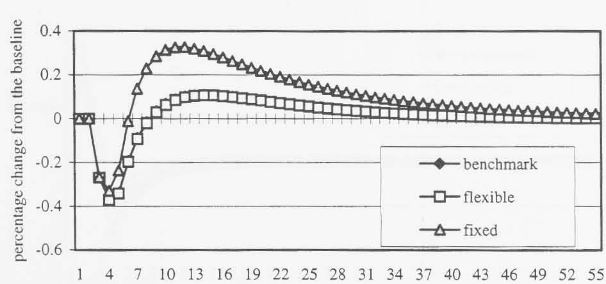


Figure 7.62: Physical Capital Stock in Construction Sector (Financial Shock)

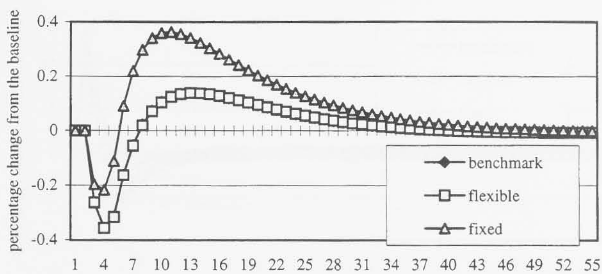


Figure 7.63: Export of Manufacturing Goods (Financial Shock)

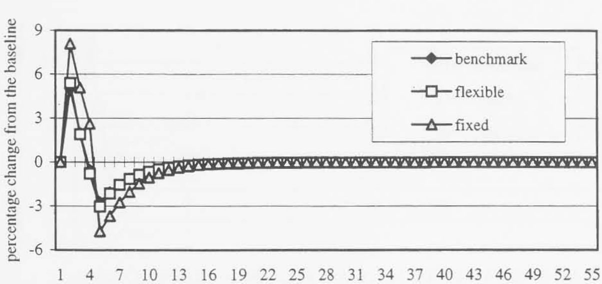


Figure 7.64: Trade Balance (Financial Shock)

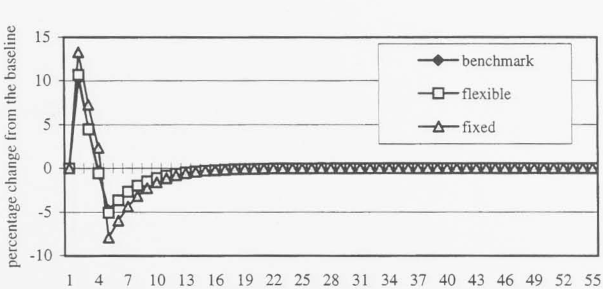


Figure 7.65: Current Account Balance (Financial Shock)

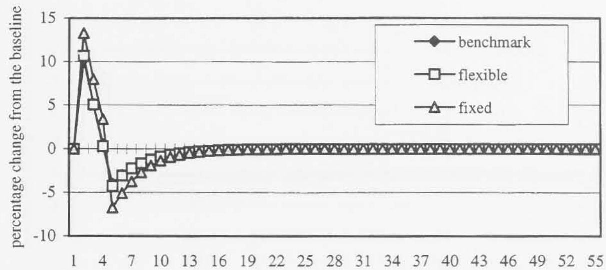


Figure 7.66: Nominal Exchange Rate (Financial Shock)

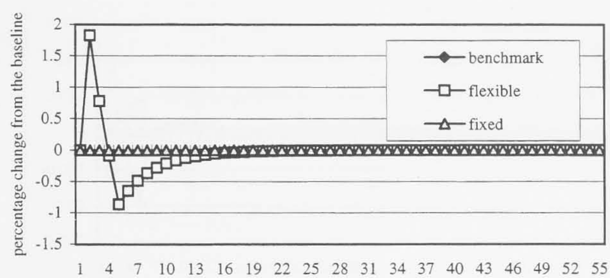


Figure 7.67: Real Exchange Rate (Financial Shock)

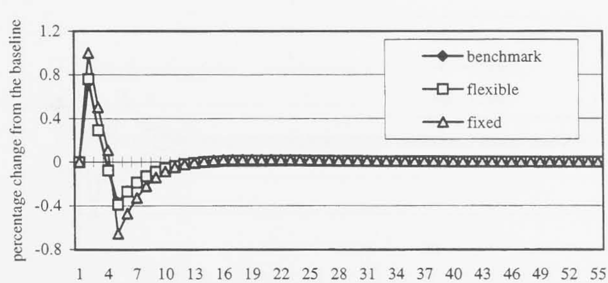


Figure 7.68: Real Interest Rate (Financial Shock)

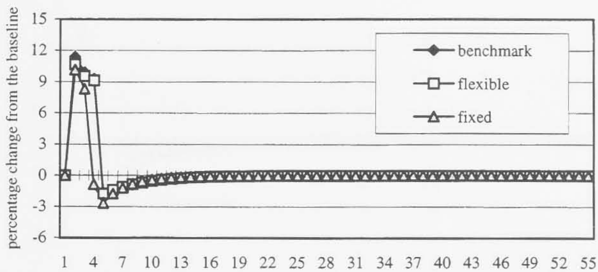


Figure 7.69: Unemployment Rate (Financial Shock)

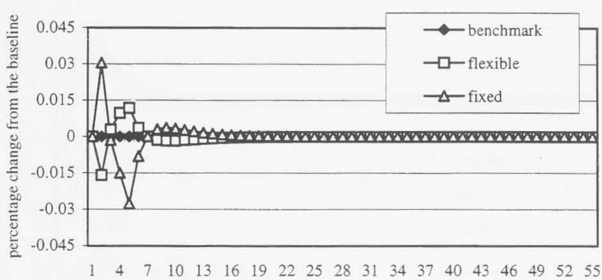


Figure 7.70: GDP Deflator (Financial Shock)

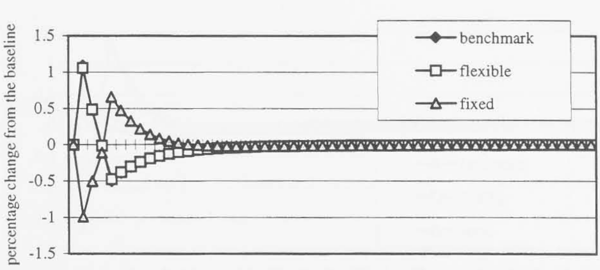


Figure 7.71: Domestic Price of Manufacturing Goods (Financial Shock)

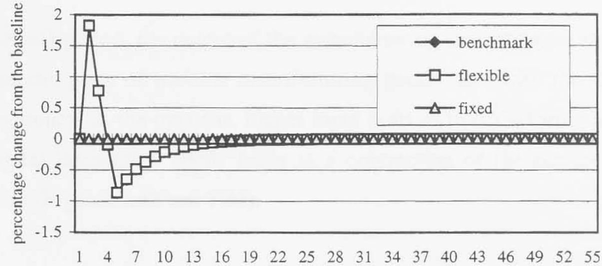


Figure 7.72: Price of Services (Financial Shock)

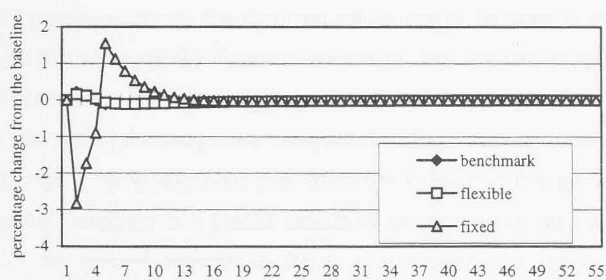
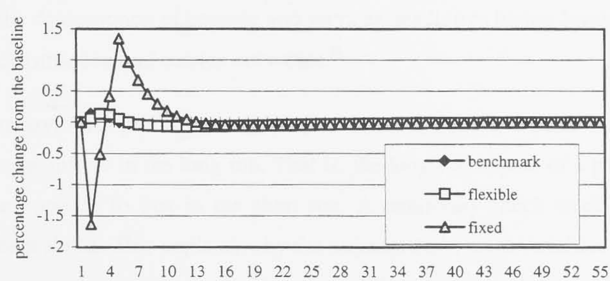


Figure 7.73: Price of Construction Output (Financial Shock)



1998 onwards. This also explains why the current account deficit in the US has deteriorated following the crisis.

In the initial period, the output of the manufacturing industry goes up (Figure 7.51), as the domestic price of tradable manufacturing goods rises with the depreciation of the home currency. In the opposite, higher input costs of manufacturing intermediate goods and capital investment goods leads to a contraction of the service and construction industries (Figures 7.52 and 7.53).

7.4.4.2 Physical & Housing Capitals

An interesting outcome is that all capital, including physical capital and real estate, rebounds strongly after periods of contraction (Figures 7.56 to 7.62). This can be understood more easily if one considers the case of a permanent financial shock. In the case of a permanent shock, the short run adjustment is the same as that of a temporary shock. Nevertheless, as the domestic subjective discount rate is still the same as the world interest rate, the long run equilibrium requires the risk premium to remain as zero. That is, the rise in the exogenous component of the premium must be balanced by an equal decline in the endogenous part. Thus, the holding of foreign assets has to go up permanently, resulting in a greater stream of dividends. As the long run equilibrium obligates the current account to be exactly evened, the trade balance must be permanently in deficit. This is achieved by joint higher consumption and lower production of manufacturing goods. Furthermore, the long run effect on manufacturing output is transmitted into smaller factor inputs, lowering the levels of capitalization and employment in the manufacturing sector. On the other hand, a higher long run income raises the consumption of housing and services, leading to higher levels of capitalization in the construction and service industries.[16]

In summary, for a permanent risk premium shock, there is capital outflow in the short run but net inflow in the long run. That is, the long run impact of a permanent shock is just the opposite to that in the short run. A temporary shock works like a truncated permanent shock. This explains why the trajectories of most variables show such strong cyclical fluctuations.[17] The fluctuations of physical capital and housing stocks are more prolonged than other variables as capital accumulations involve adjustment costs.

7.4.4.3 Dissimilarities

In contrast to the case of a land supply shock, the result for the fixed regime is different from those of the other regimes on both the real and nominal sides. For most aspects, especially in the real estate markets, the fixed regime generates much larger volatility. Again, the differences between the fixed regime and the other two regimes are a result of changes in the money supply.

The financial shock abruptly forces the nominal exchange rate to depreciate in the short run under the flexible regime. Thus, to maintain the peg under the fixed regime, the monetary authority has to contract the money supply. The contraction of the money supply is in the order of 10 percent in the short run. Recalling that a 5 percent nominal shock gives rise to short run real effects with a magnitude of 0.1 to 1 percent, the real impact arising from the exchange rate peg is roughly in the order of 0.2 percent (such as capital and housing) to 2 percent (such as consumption). Obviously, the magnitudes of the above results are subject to the values of various elasticities. Notwithstanding, it demonstrates that, with nominal rigidity, a fixed exchange regime could magnify the volatility of property market business cycles and prolong the adjustment process.

The impacts of the financial shock on the outputs of the three industries are different in magnitude but not in direction (Figures 7.51 to 7.53). Nonetheless, the impact upon the manufacturing industry is opposite to that on the service and construction industries. Aggregating the output of the three industries together (weighted by their prices) into real GDP, the flexible and benchmark regimes envisage positive growth after the shock (Figure 7.51), while the fixed regime envisages a negative result. Nevertheless, the increase in GDP under the benchmark and flexible regimes is merely a result of stronger

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[16] This has been verified in experimental simulations not reported here.

[17] Another way to make sense of the results is to consider the vanishing of the temporary shock after three periods just another shock of the opposite sign.

exports. As under the fixed regime, domestic consumption still has to contract (Figure 7.54 to 7.55).

At first glance, the result of output expansion under the benchmark and flexible regimes is counter-intuitive, especially when compared with the fact that economic recession was commonly in place following the Asian financial crisis. The 'economic boom' in the model is related to the way the simulation is conducted.

Firstly, the simulation does not encompass a fall in productivity arising from market failure. As discussed previously, financial market disarray added significantly to the wounds in the afflicted Asian economies.

Secondly, the shrinking of many Asian markets for Hong Kong exports, and the drying up of private consumption and domestic investment due to the dismal atmosphere, is crucial in explaining the abrupt downturn of the Hong Kong economy. These factors are not captured by the simulation.

Thirdly, the model comprises the home country and the rest of the world only. So, there is no competing devaluation. By the same token, the increase in manufacturing exports by the home country does not incur any downward pressure on the world price of manufacturing goods.

Fourthly, as the home currency depreciates, the domestic prices of intermediate inputs of services and housing investment goods declines relative to that of manufacturing goods. Thus, it helps boost manufacturing production.

Fifthly, due to adjustment costs, capital stocks can not be removed quickly, dampening the impact of the shock on production, including manufacturing production.

Lastly, the manufacturing sector is large in this model. At the initial equilibrium, manufacturing output accounts for 65 percent of GDP (Table 7.A3). Therefore, it is possible for expansion in the manufacturing sector to overwhelm the contraction in the service and housing sectors.

While it is useful to understand the insufficiency of the model, it is even more crucial to maintain the discussion in perspective, in that the most important aspect of the simulation results is the *relative* instead of the absolute outcomes between various regimes.

7.4.4.4 Property Price Stabilization Policy

The last issue to be examined is the impact of the financial shock under the fixed price regime. The purpose of this simulation is to examine the consequence of the Hong Kong government's attempt to stabilize property prices after the outburst of the Asian crisis (see Chapter 6). The actual action taken by the Hong Kong government was to freeze land sales for nine months. In contrast, in this simulation, the output price of the construction sector is exogenously fixed, and the land supply becomes endogenous.[18] To make the simulation more relevant to Hong Kong, the exchange rate is also fixed. Selective results are plotted in Figures 7.74 to 7.85.

To maintain the output price of the construction sector under the financial shock, the land supply has to reduce. The consequence is a much larger fluctuation of housing stocks under the fixed housing price regime than under the flexible housing price regime (Figures 7.78 to 7.81). Real GDP also experiences a much larger volatility than it would otherwise (Figure 7.74), though the swing of unemployment changes very marginally (Figure 7.83). The increase in the volatility of real GDP comes almost exclusively from the construction sector. The output of the manufacturing and service sectors, as well as the current account are largely unaffected (Figures 7.75, 7.76, and 7.82).

Recall that the fixed regime gives rise to the largest economic fluctuations under the financial shock, compared with the flexible and benchmark regimes. The above results imply that artificially stabilizing property prices, as the Hong Kong government did during June 1998 to March 1999, will magnify the business cycles and further prolong economic recovery. The results also show that the primary channel for working through the effects of fixing property prices is the construction sector and not the financial market.

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[18] It should be noted that, despite the price of construction output (i.e. housing investment goods) being fixed, effective property prices are not fixed as adjustment costs are flexible.

Figure 7.74: Real GDP (Financial Shock plus Stabilization Policy)

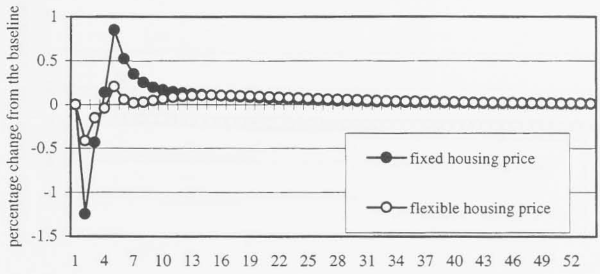


Figure 7.75: Output of Manufacturing Sector (Financial Shock plus Stabilization Policy)

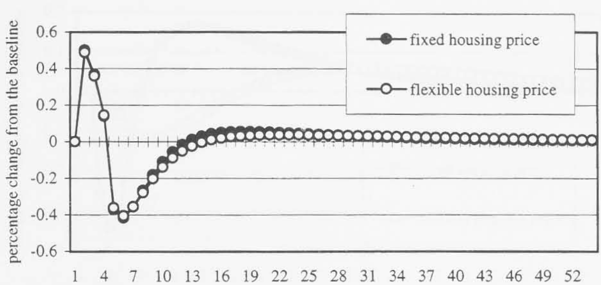


Figure 7.76: Output of Service Sector (Financial Shock plus Stabilization Policy)

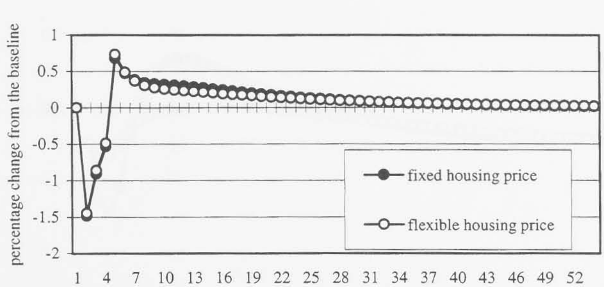


Figure 7.77: Output of Construction Sector (Financial Shock plus Stabilization Policy)

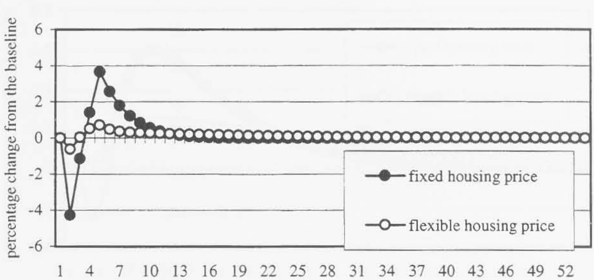


Figure 7.78: Industrial Building Stock in Manufacturing Sector (Financial Shock plus Stabilization Policy)

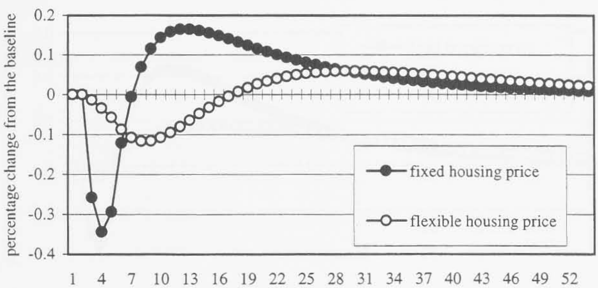


Figure 7.79: Industrial Building Stock in Service Sector (Financial Shock plus Stabilization Policy)

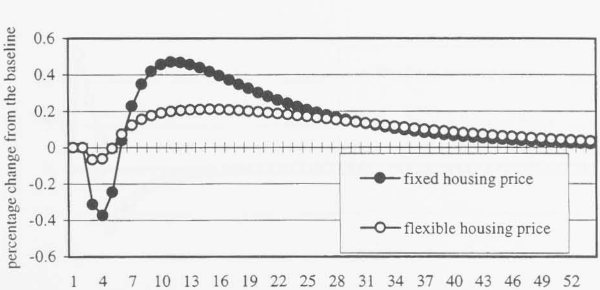


Figure 7.80: Industrial Building Stock in Construction Sector (Financial Shock plus Stabilization Policy)

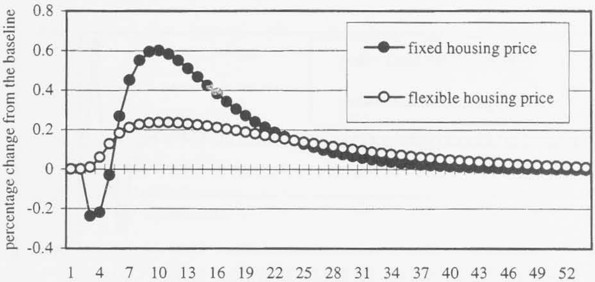


Figure 7.81: Aggregate Residential Housing Stock (Financial Shock plus Stabilization Policy)

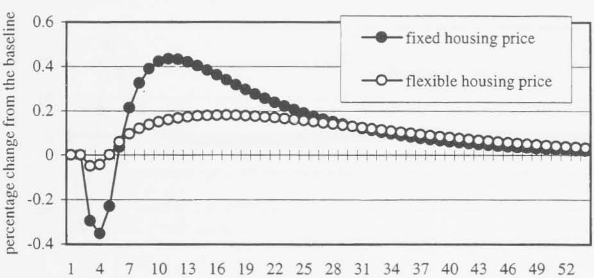


Figure 7.82: Current Account Balance (Financial Shock plus Stabilization Policy)

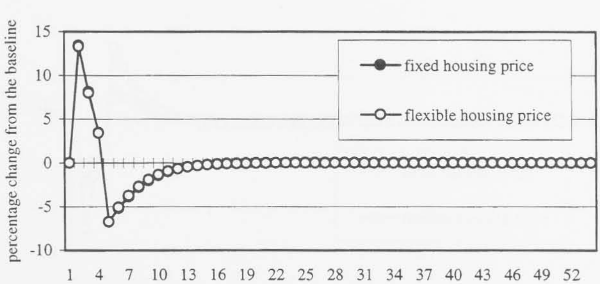


Figure 7.83: Unemployment Rate (Financial Shock plus Stabilization Policy)

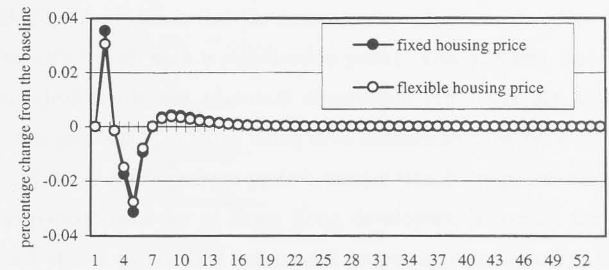


Figure 7.84: Supply of Land (Financial Shock plus Stabilization Policy)

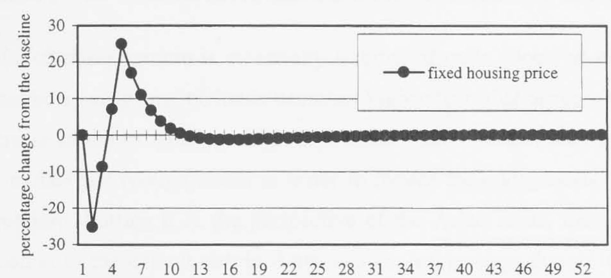
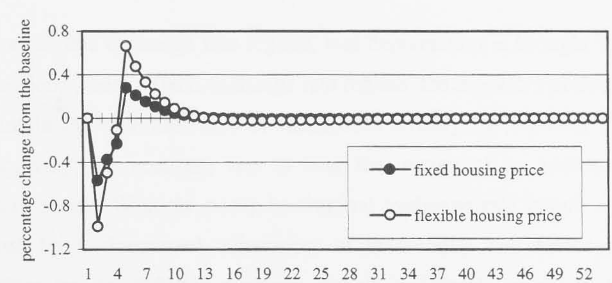


Figure 7.85: GDP Deflator (Financial Shock plus Stabilization Policy)



In Chapter 6, it was mentioned that property developers in Hong Kong pressed the government to suspend land sales to stabilize property prices. Nevertheless, the simulation results indicate that the construction industry is the main (or even the sole) sector to suffer from such a stabilization policy. This seeming inconsistency between the theoretical result and empirical observation reinforces the assertion in the last chapter that developers in Hong Kong have considerable market power. As a result, the theoretical result deriving from perfect competition assumptions may fail to pin down the monopolistic behavior of Hong Kong developers. Secondly, the existence of land banks and stocks of finished but unsold properties can in reality further bolster the benefits of a property price stabilization policy for developers.

7.4.4.5 Remarks

The results for the financial shock simulation can be summarized as follows.

The hike of risk premium is essentially a terms of trade shock on capital, in that the domestic borrowing cost of funds becomes higher than that abroad. Counterbalancing the increase in the exogenous component of the risk premium, the home country needs to accumulate net foreign assets in order to reduce the endogenous component of the risk premium. Putting it in the perspective of the Asian crisis, this is like an upward reevaluation of the default risk in Asian economies, perhaps due to 'excessive' private short-term borrowing or system weakness. This higher default risk can be neutralized by re-strengthening the debt payment capacity of the economies, through cutting down foreign debt (or in equivalent terms qualitatively, accumulating foreign assets). This requires a rise in net exports, and, in turn, a real depreciation for the home economy.

Under a flexible exchange rate regime, real depreciation is brought mainly by nominal depreciation. Under a fixed exchange rate regime, the monetary authorities are obligated to maintain the nominal value of the home currency by reducing the money supply. Consequently, the economy has to bear the impact of an additional contractionary monetary shock. With the parity in nominal exchange rate intact, real depreciation is achieved by a downward adjustment of commodity and factor prices, where the authorities try to stabilize property prices, and land supply is withheld. This is equivalent to adding another negative productivity shock to the terms of trade shock and contractionary monetary shock. This explains why the depression effect of the financial shock is exacerbated by a fixed exchange rate regime, and further aggravated by a price stabilization policy in property markets.

The findings reiterate an orthodox wisdom that, under a fixed exchange rate regime, whether a currency board or other arrangements, price and wage flexibility is crucial for the restoration of equilibrium under economic distress. Inasmuch as real estate and other commodities are imperfectly substitutable, for both consumption and production purposes, maintaining the flexibility of the property market becomes crucial in maintaining macroeconomic stability. This further implies that, in terms of macroeconomic management, conducting appropriate land and property market policies is as important as conducting appropriate fiscal and monetary policies, especially for those economies which have a substantial share of property related economic activities.

7.5 CONCLUSIONS

This chapter presents a rational expectation, intertemporal general equilibrium model to study the interaction between property markets and the wider economy in an open economy context. To resemble the Hong Kong economy, the model consists of disaggregate industrial structure and property markets. A number of comparative simulations are conducted. It is found that non-tradability, durability and adjustment costs give rise to the unique position of real estate in an economy. These economic features influence both the internal and external balances of the economy. In particular, a resource boom in the construction sector can lead to a completely opposite result to that in the tradable non-durable manufacturing sector.

The interaction between the exchange rate arrangement and property markets can be best described as a superimposition of the effects from each of them. The influence of the exchange rate arrangement comes primarily from its linkage with the money supply. As long as there is nominal rigidity, no matter whether it is due to wage or price stickiness, changes in the money supply will be non-neutral. Due to the adjustment cost in the accumulation of housing capital, the real impacts of monetary changes on property markets have stronger inertia than those on non-durable sectors. As a result, a fixed exchange rate regime might cause more volatile and more prolonged business cycles in property markets and the economy as a whole than a flexible regime.

Two policy implications of the interrelation between property markets and the exchange rate arrangement can be highlighted. Firstly, due to the special institutional setting in Hong Kong, land disposal comes under the government's control. This opens up the possibility for the authorities to conduct supply side macroeconomic management. This possibility is particularly beneficial for Hong Kong, if the monetary instrument is continuously committed to maintain a fixed exchange rate regime. On the other side, the simulation result of this chapter shows that a fixed exchange rate regime can magnify the business cycles in the property market and the economy as a whole. This represents the potential cost of using land supply and housing policies in macroeconomic management. Inasmuch as property related activities are a major component of the Hong Kong economy, any decisions about the exchange rate arrangement should come with a balance between the above cost and benefit.

To conclude, it is worthwhile pointing out some possible further improvements to the model. For instance, the review in the last chapter indicates that the private housing market in Hong Kong is characterized by high market concentration and the strong market power of property developers. Extending the model to incorporate imperfect competition and strategic behaviors would be a desirable research program. A possible way to extend the model in this direction would be to allow developers to stock up finished housing units to influence market prices. This would give rise to an endogenous vacancy rate, which is one of the important indicators of property markets. By the same token, the model could also be extended to allow developers to accumulate inventories of land. As pointed out by Dodsworth and Mihaljek (1997), building up land banks is a common strategic practice of property developers in Hong Kong. In fact, empirical research shows that, even given two to three years construction time lag, over the period 1965-90 the correlation between land sale and net private housing supply in Hong Kong was still weak (Peng and Wheaton 1994).

Secondly, the last chapter highlighted the heterogeneity of residential housing markets in Hong Kong, along with the divergence between prices and rents. The non-homogeneity of residential dwellings reflect differences in preference, product differentiation, and, perhaps most importantly, heterogeneous household incomes. These issues can not be addressed by this model in its current form.

Moreover, in the literature a lot of endeavors has already been spent on modeling the

Asian crisis. However, the performance of large-scale computational models has been far from satisfactory. The fundamental reason being that those models are not prepared to deal with the financial market failures which characterize the crisis. Moral hazard problems, short run speculative capital movements, contagion (if it does exist), and the formation of risk premiums have received little attention. The property market model presented in this study is also ill equipped in this aspect. In particular, the crucial role of real estate as collateral is over-simplified under a perfectly functioning financial market. Therefore, the model fails to capture the linkage between a property market plunge, credit crunch and banking sector insolvency. Inasmuch as the oil crises in the 1970s and 1980s have inspired modelers to improve their supply side specifications, it can be foreseen that the Asian crisis will trigger a similar effort to incorporate credit market imperfections into prevailing models. This is obviously a direction in which this model could evolve.

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Appendix 7

Table 7.A1: Definitions of Notations (in alphabetical order)

Symbol	Definition and Note
Sector Subscript (i):	
1	manufacturing industry
2	service industry
3	construction industry
4	household
Symbol:	
A	financial assets
A^*	net holding of foreign assets
C_4	consumption of non-durable goods, composed of good *1* and *2*
C_i	consumption of good i, $i = 1, 2$
CA	current account balance
EX	net export of good *1*
H_4	composite residential housing stock
H_i	commercial building stock in sector i
H_G	public-subsidized residential housing stock
H_V	private-funded residential housing stock
I_C	total investment on residential housing, composed of I_V and I_G
I_G	investment on public-subsidized residential housing
I_H	total investment on commercial building, composed of I_{Hi}
I_{Hi}	investment on commercial building in sector i
I_{Ki}	investment on physical capital in sector i
I_V	investment on private-funded residential housing
J_{Hi}	formation of commercial building in sector i
J_{HG}	formation of public-subsidized residential housing
J_{HV}	formation of private-funded residential housing
J_{Ki}	formation of physical capital in sector i
K_i	physical capital stock in sector i
L_i	sector-specific factor input in sector i
M	nominal money balance

m	real money balance measured in GDP deflator
N_4	total employment
N_4^D	total labor demand
N_4^S	total labor supply
N_i	labor input in sector i
P	GDP deflator
P_4	price of composite good C_4
P_C	price of residential housing investment good I_C
P_G	price of public-subsidized residential housing investment good I_G
P_H	price of commercial building investment good I_H
P_i	domestic price of good i, i $1, 2, 3$
P_1^*	foreign price of good 1
P_K	domestic price of imported capital
P_K^*	foreign price of imported capital
P_{Li}	price of sector-specific factor L_i
P_V	price of private-funded residential housing investment good I_V
P_{Xi}	price of composite intermediate factor X_i
Q^i	production function of sector i
q_{Hi}	Tobin's q of commercial building in sector i
q_{HG}	Tobin's q of public-subsidized residential housing
q_{HV}	Tobin's q of private-funded residential housing
q_{Ki}	Tobin's q of capital in sector i
$R(s)$	the average of the short-term interest rate $r(t)$ from time s to t
$r(t)$	short-term interest rate at time t
r^*	world interest rate
S_i	primary factor input in sector i, composed of K_i and N_i
TB	trade balance
TX	lump sum tax on household
U	instantaneous utility function
W	nominal wage rate
$\tilde{W}$	steady state nominal wage rate
X_i	intermediate input in sector i, composed of goods 1 and 2
X_{ij}	the amount of good i used as intermediate goods in sector j
Y	real GDP
Y_i	output of sector i

Z	nominal exchange rate (the domestic price of foreign currency)
z	real exchange rate
β_{16}	tie-down parameter of risk premium
β_{18}	parameter of wage flexibility
δ_H	deprecation rate of commercial building
δ_{Hi}	deprecation rate of i-type of residential housing; $i \; G, V$
δ_K	deprecation rate of physical capital
λ_j	shadow price of variable j
Π_i	real gross profit or net cash flow of sector i
π	inflation rate of GDP deflator
$(1-\theta)$	subsidy rate of public residential housing investment goods
ϕ_H	adjustment cost parameter of commercial building
ϕ_{Hi}	adjustment cost parameter of i-type of residential housing; $i \; G, V$
ϕ_K	adjustment cost parameter of physical capital
μ	domestic subjective discount rate
ξ	risk premium

Table 7.A2: The National Account

	Nominal value	% of sub-total	% of GDP
Consumption of manufacturing goods	109.38	48.54	22.37
Consumption of services	115.95	51.46	23.71
Sub-total of consumption of non-durables	***225.33***	***100.00***	***46.08***
Investment on residential housing	64.38	26.02	13.17
Investment on industrial building	34.93	14.12	7.14
Investment on physical capital	148.11	59.86	30.29
Sub-total of private investment	***247.42***	***100.00***	***50.60***
Government spending on public housing	***16.23***		***3.32***
Net exports	***0.00***		***0.00***
GDP	**488.98**		**100.00**

Table 7.A3: Relative Sizes of Industries

	Gross output value	% of sector output	% of GDP
Manufacturing export	148.11	46.55	30.29
Manufacturing intermediate	60.68	19.07	12.41
Manufacturing consumption	109.38	34.38	22.37
Output of manufacturing industry	***318.17***	***100.00***	***65.07***
Service intermediate	61.57	34.68	12.59
Service consumption	115.95	65.32	23.71
Output of service industry	***177.52***	***100.00***	***36.30***
Output of construction industry	***115.54***		***23.63***
Intermediate input	***122.24***		***25.00***
GDP	**488.98**		**100.00**

Table 7.A4: Relative Sizes of Property Markets

	Gross output value	% of sub-total	% of total
Private housing	265.09	32.89	21.70
Public housing (measured at unsubsidized price)	541.01	67.11	44.29
Sub-total of residential housing	***806.10***	***100.00***	***66.00***
Manufacturing	181.81	52.05	14.89
Services	101.44	29.04	8.31
Construction	66.02	18.90	5.41
Sub-total of industrial building	***349.27***	***100.00***	***28.60***
Total	**1221.39**		**100.00**

Table 7.A5: Prices

	Nominal value (in domestic currency unless specified otherwise)
Foreign capital investment goods (in foreign currency)	1
Output prices	
Manufacturing goods	0.40
Services	0.38
Construction (in aggregate terms)	0.37
Property prices (including adjustment costs)	
Private housing	0.58
Public housing (subsidized rate)	0.58
Industrial building	0.73
Others	
GDP deflator	1.30
Nominal wage	14.47
Nominal interest rate	0.05
Nominal exchange rate (domestic value of foreign currency)	1.23

Table 7.A6: Household's Balance Sheet

Item	Nominal value	% of pre-tax income
Real interest payment	200.63	70.75
Lump sum tax [a]	-34.62	-12.21
Real wage payment	82.93	29.25
Pre-tax income	283.56	100.00
After-tax income	318.18	112.21

(a) Negative lump sum tax means subsidy.

Table 7.A7: Values of Parameters and Exogenous Variables

$r^* = 0.05$	$\mu = 0.05$	$\beta_{21} = 1.0$	$\beta_1 = 0.7$	$\beta_{10} = 2.0$
$M = 1000$	$\theta = 0.7$	$\beta_{22} = 0.33$	$\beta_2 = 1.0$	$\beta_{11} = 0.5$
$P_K^* = 1.0$	$\delta_K = 0.1$	$\beta_{23} = 0.9$	$\beta_3 = 0.5$	$\beta_{12} = 2.0$
$P_I^* = 0.33$	$\delta_H = 0.1$	$\beta_{24} = 1.0$	$\beta_4 = 0.5$	$\beta_{13} = 0.25$
$L_i = 20.0;$	$\phi_K = 20.0$	$\beta_{25} = 2.0$	$\beta_5 = 0.5$	$\beta_{14} = 0.25$
$(i = 1\text{–}3)$	$\phi_H = 20.0$	$\beta_{31} = 12.5$	$\beta_6 = 0.2$	$\beta_{15} = 0.50$
		$\beta_{32} = 0.6$	$\beta_7 = 0.7$	$\beta_{16} = 0.0$
		$\beta_{33} = 0.2$	$\beta_8 = 2.0$	$\beta_{17} = 1.0$
		$\beta_{34} = 0.1$	$\beta_9 = 0.5$	$\beta_{18} = 0.20$
		$\beta_{35} = 0.1$		

Chapter 8

CONCLUSIONS

Synopsis 8

This chapter summarizes the findings of the thesis. It is found that, in terms of symmetry of disturbances, neither Hong Kong and China, nor Hong Kong and the US are as correlated as some member states of the European Monetary Union. Furthermore, the entrepot trade of Hong Kong has reduced the opportunity cost of choosing between the US dollar and renminbi as the nominal anchor for the Hong Kong dollar. The special institutional setting in Hong Kong provides the administration with opportunities, as well as challenges, to use land disposal policies for macroeconomic management. In particular, due to adjustment costs, business cycles in property markets tend to have strong inertia; and a fixed exchange rate regime can further magnify these cycles. The greatest advantage of the current linked exchange rate system in Hong Kong is the credibility and stability the US dollar offers. Insofar as the renminbi is not yet convertible in its capital account and largely untested for its credibility and acceptability, it can hardly be a better monetary standard for Hong Kong in the near future. This thesis concludes that as long as Hong Kong can maintain its structural flexibility, the issue of the choice of nominal anchor will be secondary to its future development.

8.1 SUMMARY OF FINDINGS

This section summarizes the findings of Chapters 2 to 7 in sequence.

The chapters are framed around three issues in relation to the exchange rate arrangement of Hong Kong as laid down in Chapter 1:

- Is it economically sustainable to form a Chinese Monetary Union (CMU) between China and Hong Kong?
- Does the indirect trade between the US, China and Hong Kong affect the choice between the US dollar and renminbi as the nominal anchor for the Hong Kong dollar?
- How does the exchange rate arrangement influence the business cycles of the Hong Kong property market?

8.1.1 Economic & Political Background

Chapter 2 provides a comprehensive review of the Hong Kong economy. Tracing the evolution path of Hong Kong, it shows that the China factor has predominantly influenced the development of the city, both economically and politically. Except during the period of China's implementation of a closed-door policy, Hong Kong has clearly defined its economic role as the intermediary between the mainland and the rest of the world. The increasing integration of the two economies is mostly a result of the private sector exploiting the comparative advantages of the two instead of policy coordination.

The second factor that has shaped the development of Hong Kong is the policy framework of positive non-interventionism. The attitude of the government to let the market run its course, plus the intrinsic flexibility of the economy, has lubricated the adjustment of the economy against a changing environment.

8.1.2 Chinese Monetary Union: Part I

Chapter 3 studies the sustainability of forming a CMU between China and Hong Kong. Using the structural vector autoregression (VAR) technique, it has been found that, in terms of synchronization of both supply and demand shocks, China and Hong Kong are not as coherent as some member states of the European Monetary Union (EMU). The result is consistent with the hypothesis that China and Hong Kong are of highly diverse economic structures, so that their business cycles are likely to be driven by shocks of different sources.

On the other hand, it has been shown that when a transmission lag is allowed the correlation of supply shocks between the two economies becomes comparable to their European counterparts. This finding is in line with another postulation that, since the two economies are deeply complementarily integrated, disturbances from the big economy (China) can be easily transmitted to the small one (Hong Kong). The empirical result has suggested the passing-through period to be about six months.

Using provincial data, it has also been verified that Hong Kong is not equally correlated to all Chinese provinces. Expectedly, it has a much stronger correlation with coastal provinces, especially Guangdong, than with inland provinces.

Drawing on the results of both this chapter and Chan (1996), it has been concluded that there is still a lack of concrete evidence that a CMU is a practicable idea at this stage.

8.1.3 Chinese Monetary Union: Part II

Chapter 4 reapplies the OCA theories upon the Chinese provinces. Measuring against a number of OCA criteria, including fiscal integration, production diversification, openness, integration of goods and factors markets, it has been found that Chinese provinces are fairly diverse, compared with the European Community and the US.

Most importantly, it has been observed that a single market for either goods or factors has yet to be established in China. Excessive administrative decentralization has transferred the power of economic decision making from the central government partly to enterprises and partly to local government. Regional competition has led to economic segregation between the provinces. Both goods and factors are not freely mobile across the provinces, dissipating the opportunities of exploring the benefits of division of labor between them.

The structural VAR and other time series modeling techniques have been deployed to estimate the symmetry of disturbances between the provinces. Only a group of six provinces around the eastern coast have been identified as being consistently highly correlated under different estimation specifications.

The result has highlighted the heterogeneity of the Chinese provinces, not only at the micro but also at the macro level. This signifies that "one-size-fits-all" monetary instruments, such as the interest rate, will be insufficient to manage the business cycles of the diverse provinces.

8.1.4 Choices of Nominal Anchors & Entrepot Trade

Chapter 5 shifts the focus to the interrelation between trade structure and the choice of nominal anchor. What underpins the significance of this issue is the fact that the entrepot trade of Hong Kong is very large, not only compared to other economies, but also compared to the direct trade itself. As detailed in Chapter 5, the US, China and Hong Kong have constituted the largest indirect trading bloc in the globe.

Conventional arguments about the relationship between trade and the exchange rate arrangement become inconclusive once more than two currencies are involved, as in the case of entrepot trade. Thereby, this chapter develops a three-country indirect trade model to disentangle the interdependence between trade structure and the choice of nominal anchor.

It has been ascertained that entrepot trade can substantially alter the impact of foreign disturbances on a small economy. The actual effect depends on the nature and source of disturbances, as well as the trade structure. But, more importantly, it has been established that as long as certain conditions are fulfilled, entrepot trade can reduce the opportunity costs of choosing one foreign currency instead of another as the nominal anchor. These conditions include: (i) the economy has a relatively large indirect trade sector; (ii) its value-added in re-exports is small; and (iii) its trade partners have relatively large direct export sectors.

In general, the trade structure of Hong Kong satisfies these three requirements. As far as trade is concerned, the result undermines the net gain, if any, of switching the monetary standard of Hong Kong from the US dollar to the renminbi.

8.1.5 Property Markets and Exchange Rate Arrangement: Part I

Chapter 6 opens up the new topic of the relationship between property markets and the exchange rate arrangement. It reviews the changes of policy setting in Hong Kong's property markets over the periods of the hand-over and the Asian financial crisis. A crucial change of the 1997 transition was the abolition of the annual quota on land disposal and its associated constraint on mid- to long-term planning of land supply.

An important policy development in Hong Kong's property markets after the change of sovereignty was the government's ambitious attempt to increase the housing supply and private housing ownership. Nonetheless, housing demand was dismantled by the Asian financial crisis. By the end of 1998, property prices had fallen by over half from their peak levels. These changes in supply and demand have been analyzed in both this and following chapter.

In this chapter, a rational expectation, intertemporal partial equilibrium model has been developed in order to understand the effectiveness of various intervention policies in property markets. It has been demonstrated that qualitative demand side policies, such as changing the mortgage loan rate, have more precise effects than quantitative ones, like changing the loan to value ratio. Secondly, it has been found that unanticipated changes in demand side policies can lead to overshooting in property prices, attributing to an inelastic supply of housing in the short run. On the other side, anticipated changes in supply side policies like land disposal can cause overshooting in housing output.

8.1.6 Property Markets and Exchange Rate Arrangement: Part II

Chapter 7 was developed on the basis of Chapter 6. The partial equilibrium model developed in the latter has been extended into an intertemporal multi-sector general equilibrium model. The model captures some institutional features of Hong Kong's property markets, such as the coexistence of private and public housing markets. But the general outcomes of the modeling exercise also have applicability to other small open economies.

A number of simulations have been conducted to examine the interrelationship between the exchange rate arrangement and property markets. An important result is that a land supply boom in the durable non-tradable construction sector gives rise to dynamic adjustment of the current account, which is the opposite to that of a resource boom in the non-durable tradable manufacturing sector. The result has drawn attention to the dynamics arising from the durability and tradability of commodities, as well as adjustment costs in open economy analyses.

The influence of the exchange rate arrangement on property markets comes primarily from its effect on the money supply. This implies that the influence hangs crucially on the non-neutrality of money. Due to the adjustment cost in housing capital accumulation, the real impact of monetary changes on property markets is more protracted than that on non-durable goods markets. This sluggishness in housing output means that, inasmuch as prices and/or wages are not perfectly flexible, the same shock could lead to stronger business cycles in property markets and the economy as a whole under a fixed exchange rate regime than under a flexible one.

On the policy front, this chapter analyzes the impact of a financial shock on an economy, and the consequence of stabilizing property prices during the occurrence of such a disturbance – as the Hong Kong government did during the Asian crisis. It has been demonstrated that a temporary financial shock – modeled as a rise in risk premium – can lead to cyclical fluctuations in property markets. Again, the generated business cycle is stronger in terms of magnitude under a fixed change rate regime than under a flexible regime. Artificially stabilizing the property price by upholding land disposal will further augment the vicissitudes and prolong recovery of the economy from the crisis.

8.2 POLICY IMPLICATIONS

The findings of Chapters 3 to 7 have delivered firm answers to the three questions raised at the beginning of this thesis. This section attempts to integrate these findings and draw some policy implications from them.

The *economic basis* for monetary unification between Hong Kong and China is that the two economies have integrated into an increasingly inseparable economic entity. Therefore, unifying the two currencies could be a means both to accelerate and explore the benefits of this economic synergy. Nonetheless, the close examination of the development of the Hong Kong economy clearly indicates its integration with the Chinese economy is based mostly on comparative advantage rather than on macroeconomic policy coordination.

An important implication of this observation is that the potential benefits arising from unifying the two currencies could be marginal, given that the structural forces which have pushed for economic fusion between the two are already so strong. The experience of the EMU has shown that the substantial dividends yielded from economic integration amongst its member states arose from market integration independent of single currency matters, such as the 1992 single market program. If the Chinese and Hong Kong authorities have the political will to strengthen the economic linkages between the two territories, efforts should first be gravitated towards removing hurdles that impede microeconomic integration. Some initiatives in this direction have been raised recently, such as to release the restrictions on the migration of mainland scientists and engineers to Hong Kong in order to boost the domestic hi-tech industries.

The cost of unifying the Hong Kong dollar into the renminbi highly depends on synchronization of the business cycles between the two economies. On this front, there is no evidence to suggest that the CMU can do better than the EMU. Ironically, the symmetry of shocks between the US and Hong Kong has been found to be anything but strong. If the lag relationship between the disturbances experienced by China and Hong Kong is still not sufficient to affirm the sustainability of the CMU, the current linked system between the Hong Kong and US dollars has to be justified by other even stronger rationales than the correlation of business cycles.

Therefore, a number of the theoretical considerations that have so far arisen from the monetary integration literature seem to be insufficient, or even irrelevant, in order to pin down the absolute advantage for Hong Kong to either stay in the US dollar zone or to switch to the renminbi zone. The findings of Chapter 5 reinforce this 'irrelevance' argument. It has been demonstrated that the dominance of entrepot over direct trade with the US and China can substantially reduce the opportunity cost for Hong Kong to choose between the US dollar and the renminbi as its monetary standard. As the intermediary function of Hong Kong has intensified due to the development of 'new' entrepot trade, such as transshipment and offshore trade, the shielding effect derived from its unique trade structure is likely to strengthen further.

Inasmuch as the *ex post* findings of many issues examined have turned out to be inconclusive, in terms of picking the optimal nominal anchor for the Hong Kong dollar, it suggests that the true determining factor has not yet been identified. It is argued here that this missing factor is the status of the nominal anchor. While China is well ahead of the US in terms of economic, political and cultural affiliation with Hong Kong, its currency can hardly measure up to the greenback when it comes to international acceptance, circulation and credibility (in fact, few other national currencies do).[1] Most importantly, China's capital account is not yet fully convertible, its monetary system is still undergoing transition from a command control system to a market oriented one, and its capacity to conduct credible stable money policies is yet to be truly tested. Thus, it would be a financial regression for Hong Kong to join the renminbi zone before China's

[1] Tavlas (1997) argues that, as the US satisfies OCA criteria to a larger extent than other major industrial countries, including Germany, France, Japan and United Kingdom, the US dollar is theoretically better posited as an international currency. Empirically, he also shows that while Deutsche mark and Japanese yen have been increasingly used in international markets after the deregulation of the Germany and Japanese financial markets, the share of the US dollar continues to account for 40 to 80 per cent of various types of international transactions.

economic infrastructure has achieved a similar degree of sophistication even to that of Hong Kong itself, let alone the US.

Whereas the current linked exchange rate system with the US dollar has provided vital nominal stability for the development of the Hong Kong economy, it has not been accomplished without cost. As indicated previously, the business cycles of Hong Kong and the US are far from synchronized. Since the monetary policy of Hong Kong is tied by the US Federal Reserve Bank, the pressure of macroeconomic adjustment weighs on other policy instruments and the flexibility of the economy.

Monopolistic control over land resources in Hong Kong offers the authorities opportunities, as well as challenges, to engage in supply side macroeconomic management. Control over land disposal enlarges the administration's room for maneuver. The benefit of this flexibility is significant, as the monetary instrument has already been pre-committed to maintain the exchange rate parity. On the other hand, due to adjustment costs, the business cycles in the property market tend to have strong inertia. More importantly, a fixed exchange rate regime can magnify the business cycles in the property market and the economy as a whole. This represents the cost of using land supply policies in macroeconomic management, especially under a fixed exchange rate regime. Given that the property market makes up a significant proportion of the Hong Kong economy, operating land policies that will strike a balance between cost and benefit becomes extremely challenging. If the administration needs to take into account microeconomic factors, such as maintaining the affordability of residential housing, that task becomes even more demanding.

8.3 FINAL REMARKS

Two final remarks can be made.

Firstly, while a unified currency can forcefully symbolize the political will of economic cooperation, it does not guarantee its delivery. The analysis of market segregation in China in Chapter 4 has already dismissed the fallacy that a single currency implies a single market. In the aspect of goods and factor market integration, there is still plenty of room for improvement before the CMU can even come close to the EMU. The merit of the linked exchange rate system in Hong Kong leans more heavily on the nominal stability and credibility that the US dollar offers than on anything else. In this aspect, regardless of the optimality of the current system, China can hardly offer a better or even comparable alternative for Hong Kong in the near future.

Secondly, going back to the fundamentals, price and wage flexibility remains the foremost criterion for designing any exchange rate arrangements. This proposition is once again verified in Hong Kong's property markets. For years, Hong Kong has been regarded as a structurally flexible, fiscally robust, and time-tested resilient economy. The important aspect of this is that, compared with many other economies, Hong Kong is in a much better position to benefit from a fixed exchange rate regime. To a certain extent, as long as all these economic characteristics are maintained, the choice of the monetary standard will be a less than primary issue for the future development of Hong Kong.

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